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VIEWS, NEWS AND INTERVIEWS.

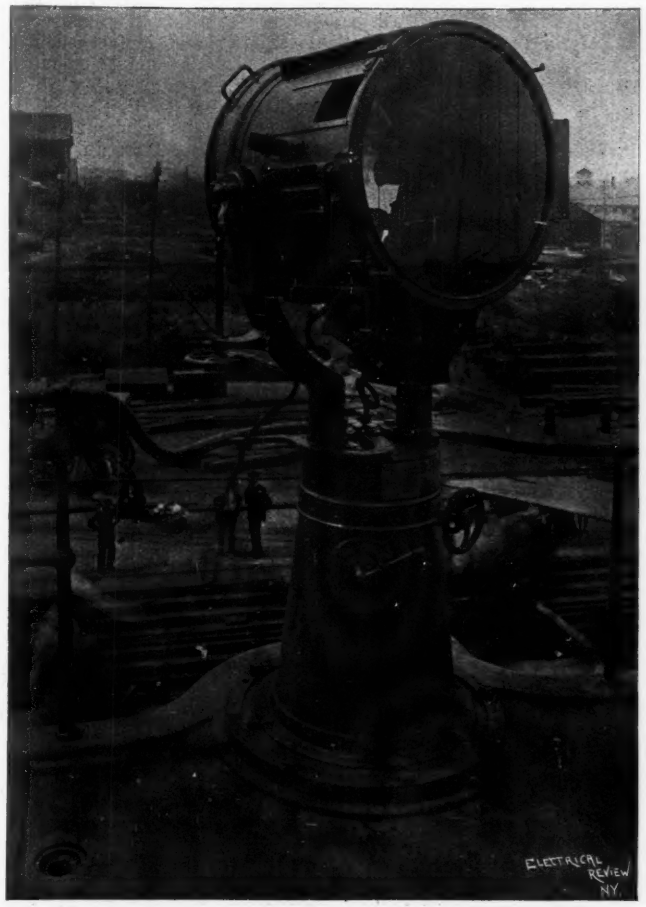
"If electric kitchens become numerous, cooks will have to learn over again," remarked Mr. Louis Mouquin, the well known French restaurant proprietor of New York. "They have learned to a nicety just how many minutes are required to cook properly, by means of coal or gas ranges, any dish ordered, but the use of electric heat brings up new and strange problems. Cooks apparently are in awe of a heat produced without coals or blaze—the mystery of the thing puzzles them and disturbs that peace of mind and evenness of movement so necessary for the artist. If electricity largely invades the domain of the kitchen, cooks will have to study the profession from an entirely new point of view to realize the most refined results of present day methods."

There is trouble on the hands of some of the electric street car conductors. Several roads have illustrated transfer tickets for passengers, using several styles of bearded faces for the men, and elderly and young faces for the ladies. The conductors must do their duty, and on several occasions have "punched" the "face" of the elderly female when the fair passengers laid claim to being classed among the young women. In some instances they have thrown away the transfer and paid another full fare rather than suffer the humiliation of being put in the wrong class. The conductors claim that they are doing the very best they can. The question will require some thought before settled to the satisfaction of the passenger and conductor.

The Natchez Light, Power and Transit Company, Natchez, Miss., has been incorporated by Maurice Moses and others. Mr. Moses is president and general manager, and Mr. Abe Moses is secretary and treasurer. The company has a ten-year city contract for 100 arc lights from March 1 next, and is putting in a plant in addition for incandescent private lighting. The company has a franchise for electric railway also, which will be taken up after light plant is started.

The "Vizcaya" Searchlight Now Used by the Battle-Ship "Texas."

The illustration on this page shows the searchlight of the Spanish ship "Vizcaya" as it appears on board the United States battle-ship "Texas." The following interesting description of how the searchlight was saved was sent to the ELECTRICAL REVIEW, on our request, by Lieut. F. J. Haeseler, of the "Texas:"



AN ELECTRIC TROPHY OF WAR—THE VIZCAYA'S SEARCHLIGHT NOW ON BOARD THE U. S. BATTLE-SHIP "TEXAS."

"The makers are Lauttier, Harle & Cie., Paris, 1893. Projector, 24-inch Mangin; voltage, 35 (about); amperes, 65 to 70. The light is an automatic power feed and regulates the length of arc excellently.

"These lights—we got both of them—were mounted one on each end of the bridge, and when the ship was burned the woodwork of the bridge burned away, allowing the lights to drop about eight feet, where they landed on top of the steel hammock nettings and were jammed between the steel supports of the bridge, and thus prevented from going overboard.

"Notwithstanding the intense heat of the burning ship both these forward lights were found to be in good working order, and in the case of the starboard light the glass door in front was not even broken. All the outside electrical connections were burned away, and the starting switch of the port light was also burned, but the working parts and projectors were not harmed in any way."

PROPOSED METHOD OF LONG-DISTANCE TRANSMISSION.

TO THE EDITOR OF ELECTRICAL REVIEW:

A method of long-distance transmission of electric currents for power and light has occurred to me and it is, I believe, original. Let a transformer be situated midway between the transmitting and receiving stations. This transformer has the primary and secondary coils of equal length, and the wire which constitutes these coils is of equal diameter in the primary and secondary coils of the transformer.

Let an alternating current dynamo be connected with the line at the transmitting station, and let this dynamo, working either independently or by means of a step-up transformer at the same station, supply the transmission line with alternating currents of very high tension—let us suppose of sufficient tension to operate either electric lamps or electric motors by means of step-down transformers in the ordinary manner at a distance of, let us say, 50 miles. At 50 miles distance from the transformer, instead of having electric motors and electric lamps, let a transformer, having its primary and its secondary coils of equal length, be placed. The secondary coil of this transformer may be connected to a second length of 50 miles of line wire. Since the primary and secondary coils of the midway transformer are of equal length, the current which leaves this transformer and passes over the second section of 50 miles will have a tension nearly equal to that in the first section of 50 miles. For example, if the current in the first section has a tension of 25,000 volts, the current in the second section will have a tension of nearly 25,000 volts.

It will now be seen that by this method which I have proposed it should be practicable to transmit alternating electric currents over nearly double the greatest distance over which they have hitherto been transmitted, while using at the transmitting station alternating currents of precisely the same tension, and while using line wire of the ordinary kind.

If desirable, the current might be

sent over a distance of 150 miles by having two transformers such as I have described. One of these might be placed at a distance of 50 miles and the other at a distance of 100 miles from the transmitting station.

Should it be desirable to transmit continuous currents over twice the greatest distance usually considered practicable, we may place a rotary transformer, which both receives and generates continuous currents of equal voltage, midway between the transmitting and the receiving stations. For example, suppose that it is now impracticable to transmit direct currents of electricity over a distance greater than 15 miles, we may, by the method which I have just proposed, transmit such currents over a distance of nearly 30 miles, the line wire and the tension of the electric current remaining precisely the same as when transmitting continuous electric currents in the ordinary manner.

If we should wish to send a continuous electric current over nearly three times the greatest distance which is practicable by the ordinary method, two continuous-current rotary transformers may be used. The first may be situated at one-third of the distance from the transmitting to the receiving station, and the second may be situated at two thirds of the distance between the transmitting and the receiving stations. For example, should it be required to send a continuous electric current over a distance of nearly 45 miles, two continuous-current rotary transformers would be set up—one nearly 15 and the other nearly 30 miles from the transmitting station.

Should the methods proposed in this article prove to be practicable, many water-powers, which would otherwise be neglected, might be profitably employed in long-distance electrical transmission.

JAMES ASHER,
Dunnville, Ont., Canada, July 27.

COMPETITION—GOOD AND BAD.

"Competition is the life of trade" is a well worn, commonplace expression which, like many proverbial sayings of the kind, is only a partial truth and to be taken *cum grano salis*. As modifying and restraining the powers of an otherwise uncontrolled monopoly and preventing the exaction of extravagant and extortionate prices it has its uses. Like, however, other things good when used in moderation, it may be the subject of abuse when carried to extremes. So long as a reduction of price allows a fair and reasonable profit to the seller and is not carried to the extent of compelling (or offering almost irresistible temptation to) reduction in quality, the purchaser is benefited nd the seller has no reasonable grounds for complaint; he is merely subject to the operation of a universal law.

Competition, however, too frequently is pushed far beyond this point, and of late years this has been very noticeably the case with electrical work. The question of first cost is in very many cases, if not the sole element at least the preponderating element, with the purchaser, and the seller or contractor in his anxiety to obtain business frequently takes contracts at a price at which he knows honest work can not be done, trusting to luck or "extras" (that vague and expansible term) to "get out of it" without actual loss.

It may be said that respectable and honorable firms will not do this. If this is granted, it would appear that firms accepted and supposed to be "respectable and honorable" are not so in fact, or that the system of *ultra* competition tends to encourage those firms who are *not* respectable and honorable at the expense of those who are.

Two other factors present themselves in this connection. One, the more or less vague nature of the specifications on which bids are made, and the other the uncertainty as to the degree of strictness which will be insisted upon in their execution. It is almost impossible, in the first place, to draw a specification sufficiently rigid to provide against every opportunity for a "smart" contractor to "skin" at some point or other. The same words even will bear a different meaning to the reputable bidder and to the "smart" one. If very exact and definite, one is liable to be held to the *ipsissima verba*, while no "blanket" clause can be drawn which will avoid all possible grounds for dispute. In the execution of the actual work, moreover, modifications and changes almost unavoidably arise, where the bidder who takes chances has an advantage.

Where the purchaser or owner has not the benefit of expert assistance to see if the specifications are faithfully carried out, the reputable contractor is at a relative disadvantage—not a true one, as he gets his contract price, does what he agreed to do, and very likely loses money; the dishonest bidder does *not* do his duty, and makes a profit.

In large contracts where probably an electrical engineer is employed the condition of affairs is better. The expert is probably *honest*, but there is, nevertheless, always the personal equation to be reckoned in. He may be easy-going, or he may be "faddy;" he may be suspicious or the reverse; he may not physically be able to inspect the whole work, or the dishonest contractor may be able to lead him astray or "bluff" him.

The reputable bidder is at a financial disadvantage in this game. He will put his cleats, of good porcelain, up with screws, perhaps, where nails would "do." He will pay a fair price for good wire, instead of buying cheap rubbish and trying to brazen it out that it is "just as good;" his switches will not get ricketty and hot after being in use a month or two; his work will be good and solid—inspector or no inspector—*but* he does this because he is an honest man and in *spite* of competition, and against the continual temptation to get somehow or other a fair return for his work.

It would be interesting to know if the ordinary purchaser or owner realizes this condition; whether he really supposes he is getting as good work by the competitive method as by giving the work to a reputable house at a fair figure, not necessarily doing this blindly, as he can usually get an approximation. He may think so, if he reasons by analogy from some trades in which the article sold is of such a standard quality and construction that there is no question possible; so many dog-collars, for example, equal to sample, or so many bushels of a certain grade of wheat. In the matter of electrical apparatus and construction, much more is necessarily left to the honesty of the maker or contractor. In inside wiring the goods delivered are necessarily concealed, and the quality is not apparent to superficial examination. Even when in view, an expert can only form a very general idea of the efficiency and workmanship of a dynamo or transformer from an inspection of its exterior, and, in fact, such things are now usually bought on faith and from the standing of the manufacturer.

It may be said that, under the inspection provided for in connection with fire insurance, the purchaser is insured at least a certain standard of excellence, so far as interior wiring is concerned. True, as far as it goes, but the fact that such rules were found necessary indicates that a very low grade of work had been done previously, in addition to which this only applies to lighting and power work, and surely work which only just avoids being dangerous enough to set buildings on fire is not of a very high grade.

Another harmful effect of excessive competition is the doubt and suspicion caused in the mind of the general public as to the reliability of electrical work and appliances in general. A burglar-alarm system, for example, installed carelessly, with a "cheap" annunciator, poor wire and slovenly methods, may cause exactly opposite effects from that feeling of security which a properly executed piece of work will give. A private telephone installation which costs as much every year to keep it in working order as the original expense of setting it up is twice cursed. It curseth him that gives and him that takes, and usually the purchaser takes a little hand himself at the cursing. If the trouble stopped at this point it would be endurable, and the two parties concerned—the parsimonious purchaser and the cheap contractor—would be the only sufferers, the punishment fitting the crime. Unfortunately, however, the public will blame all for the sins of one, and men who otherwise would be willing to pay a good price for a good thing are led to doubt whether there is "any good thing."

It is undoubtedly the fact that it is extremely difficult with a certain class of purchasers to convince them that a particular piece of apparatus or certain grades of material are worth, perhaps, 50 to 100 per cent more in the long run; they can only be taught by experience.

So that we come back to the old rule in the end, that good work and good goods will eventually win, and that a firm which has built up a reputation for honest work and good material will take the cream of the business, leaving the cheap jobs to the cheap men. This takes time.

There are, however, indications that a better feeling is growing, that the "competition" should be in *quality* rather than in first cost. Purchasers who themselves have achieved an enviable position by honest work realize that a man gets about what he pays for, and are getting into the habit of declining competitive prices, and either doing the work themselves under competent advice or placing the work in the hands of an honorable house, expecting to be charged a fair price; in either case they pay in actual dollars and cents but little more, and they do get "a good job."

It may be asked: "Are we then not to buy in the cheapest market, and pay any price we may be asked?" Not necessarily. There is no harm in getting quotations from more than one firm if this is done intelligently and merely with the intention of arriving at an approximate idea of the value, rather than to obtain "cut-throat" prices.

Here is an example from actual practice, showing that the more expensive apparatus may be the cheaper, names and actual figures not being given: A is using electric power in his factory and paying about $200 a month, he is using a cheap and inefficient motor; B, representing a high-grade and relatively high-priced motor, offers to sell A motors in the place of the cheap ones, guaranteeing a reduction of one-third in his bills for power. A accepts, sells his old motors "for junk," puts in the more expensive motors, and obtains, in fact, a reduction in his power bills of nearly 50 per cent. Of course it would not always be safe for a seller to make such a guarantee, but in the case referred to both sides were respectable people and knew with whom they were dealing.

Per contra it would be equally unwise to jump to the conclusion that one should always accept the *highest* price. A, B and C were bidding on a certain set of specifications; A bid $3,400, B bid $3,250 and C $4,800. Then C gives a figure of $3,000, and obtains the contract. Is any comment needed?

Reverting again to the question of specifications, when these are drawn by a properly qualified person, not much doubt exists as to their *meaning*, the main question being inspection and enforcement. When, however, they are prepared by persons having an imperfect acquaintance with the art (architects are the worst sinners) innumerable opportunities arise for the unscrupulous bidder to scamp the quality or to work in extras. This is another story, though nearly connected with the main trouble of "competition run mad." J. E. T.

ELECTRIC TRACTION IN PARIS.

THE MADELEINE–COURBEVOIE LINE.

BY L. BAYLY.

If the progress of electric lighting in France during the past five years has been remarkable, no less can be said of the enormous strides which traction by electricity has made, especially in the western quarters of the French capital. Paris, like London, grows steadily in certain directions, those directions being (a fact which must prove flattering to us as a race) the quarters and suburbs most favored by English and American residents. The American section in particular (from the Rue Pierre Charron to the Porte-Maillos) has been the seat of many ingeniously devised scientific conquests, most of them falling within the domain of either steam, electricity or compressed air. At present there are over a dozen lines of electrically propelled tramways doing a flourishing trade within and (in the case of the St. Denis line) without the fortifications. First and foremost there is the Madeleine-Courbevoie section, which I shall attempt to describe in detail.

The entire length of the line (seven miles) is inconsiderable, but the portions of the city traversed (Church of the Madeleine, Boulevard Malesherbes, Avenue Villiers, Bois de Boulogne, etc.) are sufficient to give it a front rank. The line is, on the whole, a level one, its most important grades being on the Avenue Villiers (13 millimetres per metre) and on the Boulevard Malesherbes (20 millimetres per metre). The method of communicating energy to the motors affixed to the bottom of the cars was a subject for some consideration. A good many systems had been tried, with partial or entire success. There was the trolley system (an everyday spectacle in America), the pillar system (where contact is made every ten feet or so by brushes protruding beneath the floor of the cars), and last, but not least, the accumulator system. It was this latter that was destined to gain the victory over its predecessors.

The adoption may have been partially hastened by the grave and at the same time ridiculous accident that occurred on the "Bastille" line some years ago. This line is worked on the "pillar system." The positive current passes along the rails, the negative through a series of steel plates situated in the precise center of the track and insulated in some fearfully inefficient way, from the surrounding wood pavement. Mark what happens. Two frolicsome horses come trotting along harnessed to a heavy dray—their driver presumably asleep on the box. One of the noble animals steps on the steel plate while the other puts his forefoot down on the rail. The bridles of both are connected by metal chains. Result—both horses drop dead like a conjuring trick, the driver gets fired bodily off the box nearly under the wheels of a passing cab, bystanders raise a halloo and the conductor of the distant tram wonders what the devil's happened to his motors. He is a young man, and short-circuiting through horse flesh hasn't as yet come under his notice. Ergo, the accumulator system booms ahead, and it is the Madeleine–Courbevoie people to whom comes the privilege of demonstrating its superior merits.

The cars—considered from an æsthetic point of view—are about as handsome as one could wish, and are constructed to accommodate 52 passengers. Two hundred accumulator cells (weight, about 3,600 kilograms) suffice for the working. They are of the "Tudor" type, with five plates apiece, and are stowed away in a double row under the long velvet seats, coupled in series.

This is their normal condition, but the requirements in the way of speed, etc., subject them to considerable variations. A switch, actuated from the driving platform, enables them to be coupled all in arc if necessary, or half in arc, half in series. A large rheostat is stowed away inside the wooden front, though, indeed, the ingenious and complex coupling devices would seem to render this uneconomical electric heater almost unnecessary.

We give a photograph of the Courbevoie station on the left bank of the Seine, where the charging of the accumulators takes place. It is an enormous shed, accommodating at least 50 tram cars and resembling in general appearance a goodly sized railway depot. Not 50 yards off is the engine-room. The power produced passes through a series of underground cables into the diminutive pillar boxes, of which three are noticeable in the photograph. The tram car about to be charged is wheeled up and connected by a flexible cable. A meter is contained in the back of each box which gives the counter-electro-motive force as the charging proceeds. Finally the needle is forced back to zero and makes contact with a platinum pin. A bell rings sharply—the car is ready to start.

FIG. 1.—"ELECTRIC TRACTION IN PARIS"—VIEW OF THE STORAGE BATTERY CHARGING STATION, SOCIETÉ DE TRACTION.

The cells are charged either at a normal rate or by over voltage—usually the latter. A quarter of an hour is all the time required to load the cars for a seven-mile stretch. The motors used ought to deserve some notice. They are by Weyler & Richmond, something similar in form and principle to those employed on the well known "Heilmann" locomotive. The armatures are wound after the "Gramme" manner, and the upper half of the magnet forms a movable cover that enables them to be inspected periodically through the flooring of the car.

I refer to the photo of the engine-room. Three high-speed Armington & Sims engines are at present in use, but two more are shortly to be added. The dynamos are of a simple, not to say elementary, form, which will be perfectly plain from the illustration, without further comment. A word or two about the efficiency of the existing mechanical traction devices will not be wasted.

When first accumulators came to the front their inefficiency was proverbial. The Paris authorities are cynical enough to believe in hard facts, and hard facts *only*. An exhaustive series of experiments has been the result, and here are some of the data:

The average "run" of any one set of accumulators is from 4,000 to 5,000 kilometres. One car there is, indeed—the Methuseiah of the line—which has reached the noble figure of 6,000 kilometres, and is still on active service. In recording and measuring efficiency, the "Richard" meter was used. According to this tell-tale dial, 11,768 hour-watts are consumed in 11 charges. Reduced, at the end of the day, this amounted to about 840 watt-hours per kilometre carriage. (One car traveling one kilometre.) On the first of May, 1897, another experiment was made, this time with Kelvin's wattmeter. One of these instruments was placed on the front of the cars, and another was set up at the charging station. Eight carriages were on duty together. Within the space of 48 hours 151 charges were consumed. The total current imbibed at the station was shown to be 1,638,000 watt-hours; i. e., 10,853 watt-hours per charge, or 775 per car-kilometre.

The instruments on the front of the cars indicated 545 watt-hours per car-kilometre. This gives a combined efficiency of cables and accumulators equal to 71 per cent—a figure satisfactory on the whole.

As for the consumption of coal, we may state that during a run of 1,042 car-kilometres (952 kilometre service and 90 kilometre trial trips), a mass of 2,700 kilograms (about 5,400 pounds) of coal was consumed. This amounts to 2.951 (5½ pounds) per carriage-kilometre. With care and economy, the company lives in hopes of seeing this reduced some day down to two kilograms per carriage-kilometre.

SCIENCE ABSTRACTS.

The following extracts of interest to our scientific readers are from the official publication of the Institution of Electrical Engineers, London, edited by Mr. J. Swinburne:

New Governor for Hydraulic Motors. E. H. Rieter—In this apparatus any excess of energy above that required for the normal speed of the motor is absorbed by an electric brake. A mass of iron is rotated in a magnetic field, and consequently becomes heated by the Foucault currents generated; the heat is dissipated by providing efficient circulation of air. The exciting current, and therefore the work absorbed by the brake, is controlled by a centrifugal governor and rheostat, the latter having a number of points which may make contact with a bath of mercury. In many cases the speed-variation has been less than one per cent for a sudden variation of 50 per cent of the normal load.

Magnetic Shielding. H. du Bois—The subject of magnetic shielding becomes every day more important owing to the great developments which are taking place in electric traction, and the consequent increase in the number of disturbing influences which affect galvanometers and other magnetic measuring instruments. The author in the present paper gives a résumé of the past work on the subject, and then proceeds to a theoretical investigation of the shielding produced by two concentric spherical shells and by two concentric cylindrical shells of ferromagnetic material on the internal space. An expression is deduced for the shielding effect, and the author proposes to discuss the results in a future paper.

Visibility of Roentgen Rays. E. Dorn — That the light effect of Roentgen rays is not due to an act of "accommodation," as has been alleged, has been proved by the author with the aid of a medical friend, who intentionally paralyzed the accommodation capacity of one of his eyes with homatropine, and found the visual effect as strong as before. The fact that a straight rod sometimes casts a bent shadow into the eye is explained by considering that Roentgen rays are not refracted by the humors of the eye. The rods therefore cast straight lines on the retina, which are ordinarily only produced by bodies bent in a certain manner. The straight lines are therefore interpreted as being due to bent rods.

Hertz Telegraphy. K. Strecker—This is an abstract of a paper read before the Elekt. Verein, February 22, 1898. When Morse signals are to be transmitted by means of a Hertz oscillator and a coherer, the spacing and duration of dots and dashes are not of cardinal importance. If, however, a Hughes instrument is to be employed, the succession of current-impulses must be very carefully timed. Synchronism is possible only at comparatively low speeds. The author therefore concludes that for Hertz telegraphy the Hughes instrument has no advantages over the Morse. A diagram shows the method of applying the Delaney closed-circuit relay system at a receiving station between the coherer and a Morse instrument; the effect of this relay is to interpose inertia, and thus to shorten the dots and dashes.

Electrostatic Properties of Cathode Rays. P. Lenard — Experiments carried out on the lines of those made by J. J. Thomson and W. Wein lead to the result that cathode rays behave in every respect as if they consisted of moving particles possessed of inertia and conveying negative electric charges. Cathode rays emerging through a "window" and entering an observation-space, produce an electric charge on any surface on which they impinge, even if the window is put to earth and the observation space is a perfect insulator. When a field is created between two condenser plates in the observation space, the rays are bent towards the positive plate. Those rays which suffer the strongest magnetic deflection also undergo the strongest electric deflection. The velocities of the various rays differ a little. They are probably about one-third of the velocity of light.

Electro-magnetic Screens. C. Maurain—Cylindrical screens, 22 centimetres high and 5.6 centimetres in external diameter, and of varying thickness, are used, made of copper, brass, lead and a zinc-copper alloy containing a few per cent of zinc. A coil of wire, concentric with the cylindrical screen, is traversed by a sensibly sinusoidal alternating current, which produces a variable field within the screen, the intensity of which is measured by the current induced in a smaller coil placed concentrically with the larger one. The induced current is measured by a kind of electro-dynamometer; the screening action is given by the ratio of the square roots of the deflections with and without the screen. Curves are given showing the decrease of this ratio as the number of alternations per second increases up to 120. With copper the decrease is rapid; with lead and brass it is small; while the copper-zinc alloy occupies an intermediate position. The screening action also increases with the thickness of the screen. It is finally indicated briefly that the results are in conformity with the mathematical theory.

Thermopiles. H. Rubens — The Melloni thermopile as generally constructed has the objection of sluggishness and a doubtful zero; it has come to be regarded as incapable of the sensitiveness of the bolometer and the radio-micrometer. By reducing the thermal capacity of the parts, the author has succeeded in making an instrument of extreme sensitiveness. He rejects antimony and bismuth, for mechanical reasons, and uses iron and constantan, both of which can be drawn into fine wires of sufficient strength. The heat-receiving junctions are arranged in a single line, one millimetre apart. With an instrument formed of 20 couples he obtains 0.00106 volt per one degree centigrade; the resistance from terminal to terminal is 3.5 ohms. Assuming that his galvanometer scale can be read to within 0.1 millimetre, he is able to measure with certainty to one-millionth of one degree centigrade, a sensitiveness that compares very favorably with the instruments of Langley and Boys.

Reference is given to a paper by A. Crova, who seems to have been the first to apply an iron constantan couple to a practical purpose. Iron constantan gives 53 micro-volts per one degree centigrade, about half the electromotive force of antimony-bismuth; the advantage is therefore only due to mechanical causes. The linear arrangement of the couples is for convenience in spectrum experiments; the author proposes to use them in the place of cross-wires. Owing to its small thermal capacity, the instrument responds with sufficient rapidity for such measurements.

Structure of Cathode Light. E. Goldstein—The author has previously shown that the cathode light of induced discharges consists of three distinct kinds of radiation, corresponding to the three layers round the cathode. The first layer nearest the cathode and the second one are composed of rays emitted in straight lines from the cathode, which penetrate through the third layer. Solid bodies placed in the second layer cast shadows, of which the umbra is filled with light similar to that of the third layer, whereas bodies immersed entirely in the radiation of the third layer cast no shadow. For brevity, the rays of the second and third layers are referred to as K_2 rays and K_3 rays respectively. Several experiments with tubes of various shapes are described, which show that the K_3 rays are emitted in all directions from every point reached by K_2 rays, and proceed from their origin in straight lines. The rays found in the umbra of bodies screening off the K_2 rays proceed from points illuminated by K_2 rays which have passed the edge of the screen; if the screen is large enough to cut off all the K_2 rays, its umbra is almost completely dark. Both K_2 and K_3 rays are deflected by a magnet. When K_2 rays impinge on a solid, diffused rays are emitted in all directions, the reflected radiation being most conspicuous, because the transmitted rays are absorbed by the solid, unless its thickness is small. The author supposes that gas molecules behave like solids to these rays, so that cathode rays reflected from the walls of a vacuum tube and Lenard rays transmitted through the walls are of similar nature, both being K_3 rays. It is, however, open to question whether the radiation resulting from the impact of K_2 rays is of the same kind as the K_2 rays themselves; their color is usually different, although they are similarly deflected by a magnetic field.

Electric and Magnetic Oscillation in Hertz Waves. K. Waitz—The object of the investigation is to show that the electric and magnetic waves possess different damping co-efficients when passing through the same conductor. The conductors examined range in conductivity between copper and acetic acid, and the method of measuring the absorption is by constructing resonators in the form of a rectangular circuit. For solids a wire of the material is bent into rectangular shape, and for liquids a glass tube of similar form is used, the ends being connected to an electrometer, as in the experiments of V. Bjerknes. The waves from an oscillator, consisting of two cylinders sparking into each other, are allowed to fall on a slit or grating formed by zinc plates, which allow either the electric or the magnetic wave to pass through, according to its position; the wave is then received on the resonator and absorbed, the amount of absorption being measured by the first swing of the electrometer needle. In the case of metals the damping is the same for electric and magnetic waves, and corresponds with the values given by Bjerknes. The electric oscillation has a damping co-efficient increasing with decrease of conductivity of the material; the absorption of the magnetic oscillation, on the other hand, first increases and afterwards decreases again as the resistance is increased. Its value is a maximum for a specific conductivity of approximately 20×10^{-8}. The anomalous electric dispersion and absorption of glycerine, amyl alcohol, ethyl alcohol and acetic acid have previously been investigated by Drude.

LIFE OF AN ELECTRICAL ENGINEER OF THE UNITED STATES NAVY.

BY PETER WINTERMUTH, U. S. N., IN "LESLIE'S WEEKLY."

Do you want to know how an electrician gets on a man-of-war, and what he does after he is there? To enter the service as an electrician, the candidate must first pass an examination by the electrical boards of the naval recruiting station at which he makes application. The examination aims to secure only those men who have a good working knowledge of the business. If successful, the candidate goes to the receiving-ship, takes his physical examination, and is "sworn in." He is furnished with his "clothing" outfit, and at this point makes the discovery that there is no gold lace whatever on any garment, and that the equipment yeoman has forgotten to put his sword in. The electrician's pay is very small, and he ranks only as "petty officer." If he has never been to sea his rate is "second class."

Until assigned to some vessel, he is kept on duty in the Navy Yard, in the dynamo-room or in the repair shops. The first few days I was in Brooklyn, the captain of the "Vermont," to which I was first sent, did not discover that he had me with him, and, as a consequence, I was sent with a working party on my second day to help load the "Sterling." As I thoughtfully marched back to the "Vermont" that night, I made up my mind to find out on the morrow what that examination was for; but it was not necessary, for all the new electricians were sent to the dynamo-room next morning, where we were given something definite to do. On my fifth day I was assigned to the "New Orleans."

On most ships of war the electricians stand their regular four-hour watches in the dynamo-rooms. We do not. The steam engineering department has charge, and it is our care to look after the circuits, the instruments, and make such repairs as are necessary. A complete test of the whole plant must be made each "quarter," and we have just finished our first one. The current is furnished by three 32-kilowatt generators "direct connected" to Armstrong compound generators. Their capacity is 400 amperes each. When it is considered that there are motor and searchlight circuits, and that the whole system needs constant attention, it may be seen that much work is necessary to keep the system in working order. The main battery, consisting of the guns, is provided with electric firing devices and miniature incandescent lamps for night sights. This power is furnished by batteries, and, beyond testing twice each day, they do not require much attention. A correct and complete log must be kept daily. This includes the reading each hour of the steam pressure, engine speed, voltage and current on the generators, with any remarks as to the general working of the system during each 24 hours. All materials expended from the electrical store-room must be carefully accounted for. When at sea in the enemy's country a man must sleep on each fighting top for possible operation of the searchlights—of which we carry four. Our work is, of course, harder some days than others. Every one knows that trouble never comes singly, and accidents on board ship, as elsewhere, "go in streaks."

When "general quarters" sounds we are transformed. "General quarters" is the signal to "clear for action." Our first duty is to place spare batteries on all the guns, cut off all circuits not necessary for the navigation of the vessel, and take down all fixtures and globes liable to be injured by concussion from the guns. When that is done we become part of the "bo's'n's" fire brigade, and are stationed aft, where we may see all the battle and possibly get our heads knocked off by falling rigging or an exploding shell. All men on the spar deck are in like danger—but the safest spot in time of action is where you are. Altogether, an electrician's position is far from being a snap. There is much disagreeable work, and it seems to a new man that the officers have unpleasant ways of saying things.

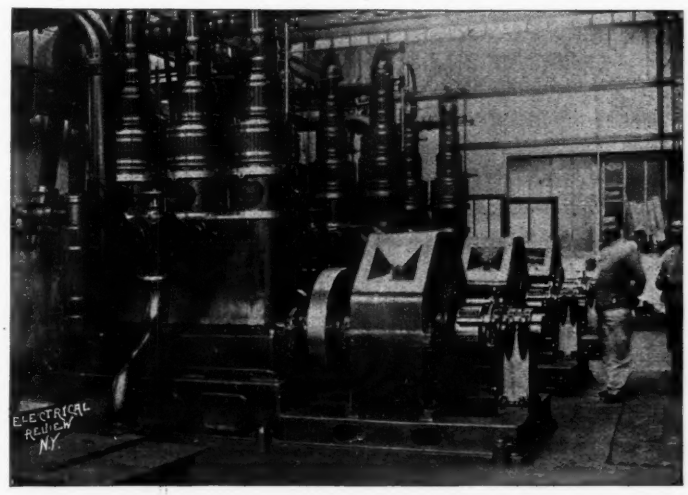


FIG. 2.—"ELECTRIC TRACTION IN PARIS"—VIEW IN THE DYNAMO-ROOM, SOCIETÉ DE TRACTION.

Electric Lights for the Queen.

The arrangements for lighting Balmoral Castle by electricity are now being carried into effect. Even during Her Majesty's recent stay there, says an English exchange, considerable progress was made with the estate work in connection with the installation. Half a mile of iron pipes of large diameter has been laid for bringing the water from the upper portion of the Gelderburn to the site of the turbine house, about a mile and a quarter from the Castle. In some places ways 12 feet deep had to be blasted through the rock for laying the pipes. Provision is being made for two Gilkes vortex turbines, which, with a fall of nearly 80 feet, will give 80 horse-power combined. This power will be utilized in driving the dynamos which will charge a large battery of accumulators at the Castle, and also for lighting the lamps direct. The current will be transmitted by large cables laid underground all the way.

The electric light will at first be limited to the Queen's private apartments, the ballroom, and a few of the principal rooms in the Castle, and it is expected that the work will be finished by the time Her Majesty returns to the north next month. Eventually more than 600 lights will be installed in the Castle alone; but if electric lighting be extended to the stables and outbuildings, about 1,000 lights will be required. Every detail, with the exception of fixing the turbines, is being carried out by the Commissioner's staff at Balmoral, assisted by some of the household electricians, under the direction of Mr. W. H. Massey, of Twyford.

The Engineers off for Porto Rico.

The "Chester," with the First Regiment of Volunteer Engineers, sailed from New York for Porto Rico on Wednesday last. Col. Eugene Griffin, vice-president of the General Electric Company, is the commander of the regiment, and a large number of electrical men belong to it. Some trouble with the engine of the ship caused a delay of a few days, but at the time of sailing she was pronounced entirely safe and all machinery repaired. Colonel Griffin made a personal inspection before sailing. The transport was saluted all the way down the Hook by passing vessels. If she had been a battle-ship she couldn't have had a more rousing send-off. The officers and men of the regiment lined the rails and sent back good-natured answers to the good-natured jibes about the transport that came from the passing harbor craft. Down in the Narrows the captain of a tug-boat shouted:

"Better set your sails. She's like an old maid—crotchety—and may take it into her head to stop any time."

"Get out! you're jealous," came from the transport. "You're sore because you haven't a $200,000 beauty."

Somebody at Quarantine suggested that the machinery was made in Spain and that was the reason it kicked up so. But the machinery worked all right after the machinists succeeded in getting it to work. When the repairs were finally completed the chief engineer said he was satisfied he would have no more trouble.

Electrical Resistance of Crystallized Silicon.

Mr. Ferdinand Le Roy, in an article in *Comptes Rendus*, suggests the substitution of resistances of crystallized silicon in place of metallic resistances when electrical heating is required. Its resistance, specific heat and emissive power are all high. It is easy to prepare sticks of pure agglomerated silicon 10 centimetres long and 40 square millimetres in sectional area, with a resistance which varies with the physical condition of the silicon, but may be as much as 200 ohms, while the resistance of similar rods of carbon is only 0.15 ohm, and of German silver only 0.00085 ohm. It follows that, for a given resistance, the rods of carbon must be much smaller than those of silicon, and the rods of German silver very much smaller still. The resistance of silicon diminishes as the temperature rises, and at 800 degrees is only about 0.6 of its value at the ordinary temperature.

Electrical Review

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Nearly 100,000 square feet of space at the Paris exposition of 1900 have been asked for by the electrical interests of the United States. There will undoubtedly be magnificent exhibits of this industry if adequate space is allotted. Commissioner Peck sails for Paris this month to endeavor to greatly increase the space set aside for the United States.

Peace has come—now to business.

It is expected that the reduction of the stock of the General Electric Company will be accomplished to-day, with no difficulty.

If there was a Vreeland at the head of the Manhattan Elevated what a blessing it would be to the citizens of New York city.

That electric gun, invented by our friend with the rubber imagination, which was described in the ELECTRICAL REVIEW a few weeks ago, has stirred up the daily newspapers. The story is going the rounds and is attracting some attention. We do not expect to see that gun built, however, for awhile yet.

Aside from the improvement in the great man-of-war guns and the better knowledge of explosives, no feature of progress has been as marked in the war equipments as the varied adaptation of electricity. Wherever possible it has been employed instead of other power. The reliability of the electrical machinery, as it has been applied to the movement of turrets, ammunition hoists and work of the most important character, is a matter of much satisfaction to the naval architects and officers who have urged its adoption against opposition.

POTTERY PRODUCED ELECTRICALLY.

An English firm has developed an electric process for the production of ceramic wares, which is stated to produce a very superior product. Photography is employed to produce the designs, and the electric furnace for burning. After the photograph has been applied to the material the photograph is put under a specially prepared glaze and burnt in. A great deal of the beauty and success of the system depends upon the use of the electric furnace, due to the regulation of its high temperatures. A representative of a London electrical paper, who examined several specimens of this ware, pronounced them excellent, and gave his opinion that the process can be applied to all kinds of ware with commercial success, as it is not costly.

DEWEY'S VICTORY AN ADVANTAGE TO ALL UNITED STATES INDUSTRIES.

We believe that every industrial and technical publication of the United States should call attention to the work of Admiral Dewey, so fitly recognized by our western contemporary, the Kansas City *Times*. Our daily contemporary says:

It has always been claimed that there was a weakness about the foreign policy of this country which prevented the Stars and Stripes from receiving proper recognition abroad. England has forced respect for the British lion all over the world, but Uncle Sam has not troubled himself about what his neighbors thought of him, and it is probably true that his very strength has been mistaken for weakness. George Dewey has changed all this, however. There will be no necessity for the American who goes abroad to claim the protection of the British flag from this time forth. Dewey has given this nation the "vigorous foreign policy" that has been so much talked of. He has taught the whole world the fact that America must be respected. He has shown what American ships can do in battle, and he has shown that this nation appreciates its strength.

And the position thus assured to our country will mean a great deal for the future of all its industries.

A FAMOUS PHILADELPHIAN'S DESCRIPTIVE POWERS.

It has been several years since the name of Keely, the famous individual of Philadelphia who, for a quarter of a century, has claimed a great deal and accomplished nothing, has been admitted to our columns. Recently, however, we came across a specimen of his literary style that we think merits preservation. We will back it for clearness, terseness and all-round exhaustion of the subject against any similar effort produced so far during the nineteenth century. It is said to be in reality the clearest exposition of his views on his vibratory principle that has ever appeared, and is as follows:

"The peculiar sympathetic conditions whereby a magnet is conserved to polar and anti-polar currents of the earth show a quality of sympathetic inflow and outflow as to prove anything but perfect sympathetic equations, as between its reception and distribution in that part of the electrical field that represents one of the triplets that in celestial physics is classified as inter-atomic vibratory oscillation. Now, if this oscillation represents in its alternating action a vibratory wave-motion representing in its corpuscular field of action, say 128,400 exchanges per second between polar reception and anti-polar (or depolar) distribution (which sympathetic philosophy proves most conclusively), the fact is established of its perfect sympathetic concordance to that third of the electrical triplet representing the sixths as classified in sympathetic physics, and thus that line of sympathetic action as represented in the magnet when it is electrically sensitized becomes thoroughly subserved to polar sympathetic attraction as a medium through which a portion of a polar flow is diverted—not latent, but highly active under all conditions as long as its sensitization exists—that is its magnetic sympathy as electrically induced, and associates itself with every medium in nature where this latent element exists, viz.: steel, iron, oxygen at a low temperature, etc."

We are interested to learn more about that "electrical triplet," one-third of which represents a classified sixth!

BOOK REVIEWS.

The following books and pamphlets have been received:

"Annual Report of the Wire Department," Boston, Mass., kindness of Mr. Thomas W. Flood, commissioner of wires.

"Proceedings of the United States Naval Institute," June, 1898, Annapolis, Md. An interesting article by Lieut. B. T. Walling, U. S. N., entitled "Diseases of Electrical Installations in the Navy—Their Causes and Remedies," is published with illustrations.

Journal of the Institution of Electrical Engineers, July, 1898, London.

Journal of the Franklin Institute, August, 1898, Philadelphia.

Bulletins Nos. 11, 12 and 13, from the Idaho University, Moscow, Idaho, have been received.

"ELECTRICAL TESTING FOR TELEGRAPH ENGINEERS," by J. Elton Young. The D. Van Nostrand Company, New York. Price, $4.00. Supplied by the Electrical Review Publishing Company.

This is an important and timely work, and its scope includes the theory and practice of testing as applied to electrical lines in general. Not only is it of interest to the telegraph and telephone engineer, but it may prove of service to the electrician in charge of cables for the transmission of light and power. It is a book of 264 pages, and is thoroughly illustrated and well printed.

Edward Marshall, the correspondent, who dictated his account of the Rough Riders' fight after the surgeon told him he was mortally wounded, has written his recollections of that day, while slowly convalescing in a New York hospital. It will appear in the September *Scribner's* under the title, "A Wounded Correspondent's Recollections of Guasimas."

Leslie's Weekly is doing splendid work in illustrating and describing the war with Spain. This journal was never more interesting, and is thoroughly up to date.

OBITUARY.

Dr. Gardner Quincy Colton, to whom belongs in part the credit of anæsthesia by laughing gas, is dead in Rotterdam at the age of 84 years. The cause of death was paralysis. Besides being a dentist, Dr. Colton was a physician, a lecturer, a critic, an electrician, and at one time a gold prospector, having gone to California with the argonauts of '49, both to search for gold and to practice medicine among his fellow adventurers. It has been claimed that he invented the first electric motor ever run, but it never got beyond the model state, though the little machine which he built worked very well.

Dr. George B. Richmond, a prominent dentist, died at Lansing, Mich., August 3, aged 49 years. Dr. Richmond was of a mechanical turn of mind, and many friends gave him credit for being the inventor of the telephone. He applied for a patent a little later than Bell, the inventor, but was claimed to be prior to Bell in discovering the principle of the telephone. The Bell people were so greatly exercised (so the story runs) over Dr. Richmond's application that they sent an agent to purchase his patent, offering him $10,000 in cash and a permanent salary. He was dissuaded from accepting the offer by friends, who believed he could establish his claim to priority. A company was formed, but it failed to furnish the necessary money and the claims were permitted to go by default.

Wall Street and the Electrical Stock Market.

During the week the range of prices, both for stocks and bonds, was higher than last week. Good judges assert that Wall street is entering on a period of activity which will last several months. Naturally the most favorable influence is the ending of the war. The crop prospects are bright and railroad earnings satisfactory.

There is said to be hope of better things for the American Electric Heating Corporation, of Boston. The bondholders and stockholders are chiefly the same persons and are said to be content to go without their interest and effect no radical reorganization at present. It is thought that the extensive use of electrical heating apparatus will depend largely on a reduction in cost of electric current. Mr. J. I. Ayer is the general manager of the heating company, which has a capital of $10,000,000. It was reported at one time that this capital was to be scaled down to $1,000,000.

On the Boston exchange to-day American Bell closed at 281 and Erie Telephone at 72. Western Union closed in New York at 94.

New York, August 13.

PERSONAL.

Prof. F. A. C. Perrine, of Stanford University, has been spending several weeks on the Atlantic coast, and starts this week to return to California.

Mr. A. H. Patterson, vice-president of the Phœnix Glass Company, returned to the city last week, having enjoyed several hair-breadth escapes during his vacation in the wilds of the Empire State.

Mr. James Mitchell, of Rio Janeiro, is spending a few weeks in the city making his headquarters with his friend, Mr. E. B. Latham, 136 Liberty street. Mr. Mitchell has been for the past seven years a resident of Rio Janeiro, and does a very extensive electrical business throughout South America. He has many friends in the United States who are glad to learn of his excellent success.

Mr. Henry Hine, general manager of the Stanley Electric Manufacturing Company, Pittsfield, Mass., spent a portion of last week in this city, a guest of the Waldorf-Astoria. Mr. Hine is not only a very successful electrician and electrical manager, but is an acknowledged expert with the rod and reel. It is stated that when Mr. Hine visits the Thousand Islands the pickerel and bass of those waters, like Davy Crockett's coon, immediately surrender and swallow any bait that he chooses to give them.

Electric Delivery Wagon.

Prof. William D. Marks, president of the General Electric Automobile Company, of Philadelphia, publicly tested the first of the new vehicles constructed under the patents of his company recently. It is a delivery wagon of the most modern type run by electricity. The motors are attached to the rear axle of the wagon, and by means of pinions they engage in phosphor-bronze gearing attached to the hind wheels. The steering of the wagon is accomplished by a worm working in gear on the fifth wheel.

Professor Marks, who has had general charge of the construction of the latest form of automobile, believes that dozens of similar wagons will be in daily use in the service of the department stores of Philadelphia soon.

Some Electrical Figures.

A local contributor who has been making a little investigation has dug out a number of very interesting electrical facts. In 1884, he says, the total investment in electrical appliances throughout the United States did not aggregate much over $1,000,000, while to-day the capitalization of all the electrical concerns in the country is fully $1,900,000,000. In 1884 a 50-kilowatt dynamo was considered a large machine, and the price of dynamos was about 20 cents per watt of output; at the present time the largest size generator built is of nearly 5,000-watt capacity, and dynamos in comparatively small sizes, without switchboards, now cost about two cents per watt.

It is estimated that about $600,000,000 has been invested in electric lighting stations and plants in the United States. There are to-day in the United States about 14,000 miles of electric railroad, with a nominal capital of about $1,000,000,000, and employing about 170,000 men.

People can now actually converse at a distance of 1,800 miles, and conversations at distances of 1,500 miles are common. There are now nearly 1,000,000 telephones connected with this country's telephone service, employing a capitalization of about $100,000,000. Every day about 17,000 employés make on an average more than 3,000,000 telephone connections.

Improvements at White Plains, New York.

The White Plains Lighting Company has assumed control of the Citizens' Gas and Electric Company, of White Plains, N. Y. The new company has made a contract with the New England Engineering Company for considerable improvement to the present electric and gas plant, which will be thoroughly modernized and considerably added to.

The doings of our army and navy continue to occupy many of the pages of *Collier's Weekly*. The frontispiece shows the battle ship "Texas," recently ordered North for repairs, making her way to the Brooklyn Navy Yard amid a storm of cheers and other congratulations such as no other vessel ever received in American waters; there is also a page of interesting photographs of portions of the vessel itself. The double-page plate is a fine drawing by Wenzell, entitled "An Amateur War Board"—three fine, old men, evidently retired naval officers, planning how battles should be fought and won.

A BUSINESS BOOM.

The Philadelphia *Press* has an editorial predicting a boom in business. It enumerates the following reasons:

The signed protocol closes the war, and all the business world will make ready for the business boom near at hand. Its causes are numerous.

1. For three years past the Cuban question and our relations with England have been a perpetual threat to trade. The Spanish war ends both.

2. The currency question is settled. Every Republican convention, East and West alike, is taking advanced gold standard ground, and Democrats dodge silver.

3. Capital, long alarmed by the double danger of foreign war and a silver basis, will begin on new enterprises.

4. For six months, or since the "Maine" blew up, everybody has been waiting to see the result. Plans, purchases, orders, enterprises, contracts have been held up. All these now come with a rush.

5. The crops are of the best. Wheat unexampled, corn a first-class crop, and cotton, certainly large, and probably very large. The farmer paid mortgages with the last crop. He will buy goods with this year's yield. Exports of manufactures are supporting prices. Imports of manufactures steadily shrink. National revenues are ample. War scares, currency scares, railroad collapse — all the causes for panic are gone.

Nothing can prevent the great boom these causes will bring this Fall.

Absorption of Electric Light Companies in Chicago.

The Chicago Edison Company has completed the absorption of every important corporation now furnishing electric light inside the city limits of Chicago. The names of the companies which have been absorbed by the Edison are given as follows:

Hyde Park Thomson - Houston Light Company, Hyde Park Electric Light and Power Company, People's Light and Power Company, People's Electric Light and Motor Power Company (town of Lake). Mutual Electric Light and Power Company (Hyde Park), Englewood Electric Light Company, West Chicago Light and Power Company, Western Light and Power Company (Lakeview), Edgewater Electric Light and Power Company, Chicago Structural Electric Light Underground Company, Commonwealth Electric Light Company.

The *Review of Reviews* for August contains some extremely interesting reproductions of pictures of the war from Spanish papers. The Dons were winning every time.

ELECTRIC CARRIAGES.

SOME RECENT IMPROVEMENTS IN ACCUMULATORS AND THEIR APPLICATION TO TRACTION ON COMMON ROADS.

BY J. T. NIBLETT, ENGLAND.

Means of vehicular locomotion by the aid of some power other than that of horses is a subject that is now receiving a vast amount of attention. Not only is it of interest to electrical and mechanical engineers and carriage builders, but it has been taken into serious consideration by all those responsible for the regulation of traffic in our large towns. The subject is of such huge importance that it not only affects those whose business or pleasure calls for some rapid and safe means of transport from place to place, but it affects the safety and comfort of the ordinary pedestrian as well. Our present system of horse traffic is open to many objections, not only from a humanitarian point of view, but from its sanitarian and economic aspect as well. The streets in our large towns would present a vastly different aspect if, instead of horses, some other means of drawing our vehicles were used.

Much attention has been given to the application of steam, petroleum and spirits to produce the necessary motive power, but there is but little doubt that electricity will eventually supersede them all, not only on the score of economy, but owing to its freedom from heat, steam, disagreeable odor, and to the ease with which it can be manipulated.

Chloride cells are well known and largely used for traction purposes in America, and they are very well received in this country also.

A form of cell which is just now exciting much attention on the Continent is known as the "Marschner" cell. The Marschner battery is at present being used on the Dresden tramways, and it is said to be behaving in a very satisfactory manner. The plates are stated to consist of the ordinary oxide of lead, incorporated with powdered amber and an essential oil. This mixture is said to "set" very hard, the resultant plate being of a tough metal-like nature. On the Dresden car 144 cells of this type are being used. Each cell contains 13 plates, and is said to weigh only about 28 pounds. The weight of the complete battery is given as 5,290 pounds. Its efficiency is stated to be over 90 per cent, and if discharged at its normal rate—that is, 65 amperes—an energy capacity of 13 watt-hours per pound of cell is obtained.

When devising cells for traction purposes many difficulties have to be overcome. Owing to their high initial cost, a small number of cells should be made to suffice, and these should be so constructed that they will run a vehicle for a reasonable number of hours with one charge. They should be capable of being charged and discharged at rapid rates. Above all, they should be able to withstand the jolting and jarring incidental to their being run over rough and uneven roads. The cell should be so constructed that the wash of the electrolyte does not remove the active material.

There is at the present moment an enormous field for an inexpensive cell which will combine large capacity with small weight and great solidity. Some form of mechanically solid cell seems to offer the best solution for this problem. Some little time ago great hopes were entertained that the solidity problem had been solved by the introduction of Dr. Schoop's solid electrolyte. This so-called solid electrolyte was made by adding silicate of soda to the ordinary solution, which caused it to set and become of a gelatinous nature. In this country some practical tests have been made with Mr. Barber–Starkey's method of making solid cells by substituting for the electrolyte a mixture of wood sawdust and plaster-of-paris, which when set was moistened with dilute sulphuric acid.

The accumulator known in America as the "Hatch" is of a mechanically solid nature. In this case metallic frames are not employed for supporting the lead salts, as they are held within a porous earthenware grid serrated on one side, and having small square recesses on the other. Plain lead plates are used as conductors, and these are bedded on the moist lead salts. According to this arrangement there is no clear liquid space between the elements, as the serrated earthenware plates touch one another, and are so placed that the ridges on one plate are placed at right angles to those on the other. Wooden clamping plates with india-rubber bands placed around them are fixed on the outside of each end element, and these serve to give the requisite elasticity. The "Pumpelly" cell is another American production, and in this case the mechanical solidity of the cell is arrived at by inserting plain, thick, porous earthenware plates between the elements. In this case, however, the plates are placed horizontally instead of vertically as in the "Hatch."

One great drawback to the employment of a viscous, gelatinous, or semi-solid electrolyte arises from the fact that when such substances are interposed between the plates no free circulation of the liquid is possible. In all secondary batteries, as already shown, the activity of the elements depends entirely upon chemical action, and as the electrolyte is the medium through which all these reactions occur it seems highly probable that anything which prevents its free access to the active material, or in any way impedes its circulation, must be detrimental, and consequently lead to loss of efficiency and capacity.

For central electric light stations, or for such work as levelling up the loads on electric tramways, where moderately constant work is required, a battery whose weight is large, or whose bulk is great, may be safely used. For self-contained electric light installations, weight and space occupied by the battery is of some moment; and where intermittent charging only is resorted to, absence of local action is desirable. The battery, under these circumstances, may have to stand idle for considerable periods, and it would not do for it to lose its charge while thus waiting.

In appearance the London electric cabs are similar to the "coupé" type of horse vehicle. The inside is upholstered in leather, and the comfort of the passengers seems to have been studied in every way. At night the interior is lighted by an electric lamp, while the outside is rendered resplendent by two brilliantly-lighted side lamps.

The driver's seat is in front, and is placed much in the same position as in the ordinary four-wheeler. The dash-board is rounded instead of being flat, and this tends to give the vehicle a less angular aspect than it would otherwise have. Immediately in front of the driver the starting, stopping and stearing gear is placed. The battery used is a special Faure–King type, and is supplied and maintained under contract by the E. P. S. Company. The plates used are thin, and to prevent the active material being "washed" out the surfaces are covered with a layer of silicated asbestos held in position by thin sheets of perforated vulcanite. The whole of the cells are mounted in a tray, which is slung underneath the cab by four suspending links. These links are supported by springs under compression, and, as an extra safeguard against vibration, the ordinary carriage springs again support the battery tray. The total weight of the battery is 14 hundredweight. The total weight of the complete vehicle, including driver and its full complement of passengers, is approximately 30 hundredweight. The electric motor used is one of the Johnson–Lundell type with double windings on both fields and armatures, and is capable of developing at normal speed about three horse-power. The motor, which is placed in the hind boot, is connected by gearing to a countershaft and thence to the back wheels by an endless chain. This driving chain is of the Renold's laminated type. The sprocket arrangement usually employed is dispensed with, and as the chain runs on the pinion and chain wheels with some side play it is worn evenly, and is found to retain its efficiency until it is completely worn out.

The starting, stopping and back-driving arrangements are of simple construction. On the left-hand side of the driver's seat a lever handle is placed; when starting, the lever is pushed forward, and by a stepping-up arrangement the more forward the lever is pushed the faster moves the vehicle. Drawing back the lever slackens speed, and when drawn beyond a stationary point the carriage runs backward.

It is said that to remove an exhausted battery and reinstate a charged one does not occupy more than five minutes, much less time than is required to take out and put in a fresh horse in an ordinary cab.

In New York some electric hansom cabs have recently been put on the roads. The cabs are made by the Electric Carriage and Wagon Company. In some respects they resemble our London hansoms, but the vehicles are fitted with four wheels instead of two. The back wheels are used for steering and the front for driving. The chief feature of this cab is that two motors are used, one for each of the driving wheels. By employing two motors, various variations of speed can, of course, be obtained by running them in parallel or series, and by having each wheel under separate control, quicker turning power of the vehicle can probably be obtained. This is doubtless the object the designers of the New York hansoms had in view, although it is very problematic if any very real advantage is gained by such an arrangement, unless it be used in heavy vehicles, such as coal lorries.

The New York cabs are said to weigh 3,000 pounds. Each motor develops one and one-half horse-power with 75 volts, and at a speed of 800 revolutions per minute. This represents a speed of eight miles per hour for the vehicle. The battery used consists of 44 cells placed in trays containing 11 cells in each. The four sections are placed in a receptacle in the rear of the vehicle. No loose terminals are used, contact between the sections and other parts being established by means of plates and contact springs. Each cell contains three plates of the chloride form, and they have a useful capacity of 100 ampere-hours when discharged at 21 amperes—the normal rate. The whole battery weighs 900 pounds. Speeds varying from four to 15 miles per hour can, it is said, be obtained with varying battery discharges of from 12½ to 40 amperes.

L'Electrique Société Anonyme, of Brussels, have recently introduced an electrically propelled dog-cart. In this vehicle, and according to the usual practice, the battery cells are placed underneath the seats. Forty-eight cells of the Planté type, having a capacity of about 75 amperes, are used. The total weight of the battery is 850 pounds. The motor is wound with the coils of the fields and armature in series, and it weighs about 260 pounds. A speed of 1,750 revolutions per minute is attained with a battery discharge of 21 amperes. The motor is connected to the driving wheels by reducing gear and chain bands, while differential movements of the driving wheels are ob-

tained by the use of an intermediate clutch.

As a means of regulating speed in a self-contained motor car, actuated by batteries, two methods are at present in vogue. The first is by splitting up the battery into sections by a suitable commutating arrangement, thereby putting the sections either in series or parallel as required. The objection that may be raised to this plan is that the cells may be unequally discharged. A more practical method, and one adopted on the London cabs, is using the battery as a complete unit, and obtaining the various speeds by commutating the coils in the fields and armatures of the motor. It is possible that some method may be adopted by which the motor may be run at constant speed, while the speed variations in the car are obtained by suitable gearing. According to present practice the motor, when starting the vehicle, is running slowly, and therefore in its most inefficient condition. If the constant speed idea were utilized, the motor might be of smaller power, and it could also be run at a higher and more uniform efficiency.

For the Paris electric cabs, Messrs. de Puydt & Poncin, of Birkenhead, are supplying some special motors which appear to compare favorably with those used in our London cabs. It is stated that these motors, which only weigh about 170 pounds, will develop 8.5 horse-power for 20 minutes, or 4.5 horse power for continuous running without any undue heating or sparking. The normal speed is given as 1,700 revolutions per minute, and a commercial efficiency of 81 per cent is said to be obtained.

As regards the prevailing method of connecting the motors to the driving-wheels by the system of gearing, probably with our present knowl edge it is the best that can be done. Some way of dispensing with gear and running direct will probably be devised. If this could be done, not only would it lead to great economy in working, but it would greatly add to the comfort of the passengers. When riding, for instance, in one of the London electric cabs, in addition to the hum of the motor, which is not at all unpleasant, one's ears are assailed by the clanking and rattling of the gearing and chain. If direct running or some more silent method of gearing could be devised, it would be a desirable improvement. Improvements in the wheel tires will doubtless be made, and such improvements would tend to reduce road friction, and thereby save power or give increased speed. They would also reduce the depreciation in the working parts and give the battery a better chance.

Methods of electric locomotion on common roads present enormous possibilities. Electrically propelled omnibuses, broughams, dog-carts and light parcel delivery vans may now be seen running along our thoroughfares. There is no reason why the same plan should not be adopted for driving vehicles for the cartage of goods generally. In the latter case appearance need not be studied to such an extent as in the passenger-carrying conveyances; therefore, in this case the electrical engineer would have a freer hand, and better results might be anticipated.

Means of recharging will have to be seriously considered. There seems no reason why in all our large towns charging centers should not be established. The ordinary cab is stationary a great part of the day, and there seems no valid reason why the charging operation should not be rendered so simple that a cabman of ordinary intelligence could easily perform it. With an "in-and-out" electricity meter placed on the vehicle in a convenient position on the battery circuit, the driver could see at a glance how much energy had been put in and taken out of his battery; therefore, would know when a recharge is required; also, when charging, by reference to the meter he could see when his battery is satisfied. Such a measuring instrument with the small range required need not be an expensive addition. A supply system worked on the penny-in-the-slot principle could easily be arranged.

A Government Cable Order Placed.

An order for 25 miles of cable, such as is used for harbor defense work in mining, has just been given to the Bishop Gutta-Percha Company, of New York, by the government. This company executed an order for 20 miles of this cable for the government early in the Spring.

It is generally known, by those interested in the wire trade, that at the breaking out of the war the War Department did not have a sufficient amount of the grade of cable used for harbor defense work on hand for accomplishing much important work, and a number of the large cable and wire factories received rush orders. It is said to be the intention of the War Department to lay much of the cable as fast as the several orders are delivered, merely having it in readiness without placing mines in connection as the cable has a much greater length of life under water than when subjected to the usual atmospheric changes.

Copper Mines in Vermont.

Vermont is receiving considerable attention lately by experts interested in copper mining industries. The Ely copper mines, which were for some time the third largest copper producing mines in the United States, but were practically abandoned by some financial difficulty, are again being investigated. Recent discoveries bid fair to bring this section again to the front as a copper producing region. A new lead recently opened in South Strafford, Vt., is also capable of profitable development.

General Electric Stockholders Meet and Adjourn One Week.

The General Electric stockholders' special meeting was held at Schenectady, August 10. It required four hours to examine proxies and powers of attorney representing 237,654 shares of common and preferred stock. The meeting's object being to reduce capitalization from about $31,000,000 to about $21,000,000, in order to pay dividends thereon, the question of injunction arose.

Chairman Charles A. Coffin read an opinion of counsel, to the effect that Livermore's bill of complaint, now pending, would not cause any restraint to issue. Should its plea be granted, all stockholders would return to original ratings. Legal arguments having continued the meeting to a late hour without effecting any action upon capitalization, on motion of Oliver Ames, an adjournment was taken until Wednesday, August 17, at 10 A. M., when decision will doubtless be reached.

Electric Cars on Broadway.

President H. H. Vreeland, of the Metropolitan Street Railway Company, has announced that as soon as the Sixth and Eighth avenue roads were in operation the system on the Broadway and Columbus avenue lines would be changed from cable to underground trolley. This will enable cars to be run where they are most required at certain hours. A very large force of men are at work on these two avenues, rushing the job to completion at a marvelous speed.

"In the morning, when business men are bound downtown," Mr. Vreeland said, "we will run a large number of cars quickly and directly into the business section from every point uptown. Cars from Second, Lexington, Madison, Sixth, Eighth, Columbus and Amsterdam avenues will all turn into Broadway at convenient points. At certain hours a large proportion of the cars on the uptown lines will be run direct to the shopping district. Cars from Amsterdam, Columbus, Eighth, Madison and Lexington avenues will be run through Fifty-ninth street and down Sixth avenue and back again. During the evening, when people want to get to the theaters, all of our uptown lines will converge into Broadway. By the time that we get the system in good working order the company will have expended fully $15,000,000. We expect to be able to run the electric cars down to the lower end of Sixth avenue by October 1 at the latest."

Dr. A. D. Thomas, of Little Rock, Ark., has filed application in the Federal Court for a receiver of the property of the Standard Light and Power Company, of Fort Worth. The property is valued at $75,000.

TELEPHONE NEWS AND COMMENT.

It is announced that an appeal is to be taken in the case of the Carty bridging bill.

The Rocky Mountain Bell Telephone Company is making quite an extension of its lines in Montana.

The manufacturers of telephone apparatus for independent companies are anticipating a particularly heavy Fall business. The demand for new apparatus is already increasing in many sections.

The project of establishing a new telephone company in Worcester, Mass., has been renewed. and the projectors have held several meetings of late, and propose to immediately apply for a charter. The plan is to call it the People's Telephone Company, incorporate it under the laws of Massachusetts, with a paid-in capital of $150,000, and furnish telephone service at less price than is charged by the Bell telephone company. The men interested are I. L. Currier, Henry W. Aiken, C. H. Sanborn, Dr. Herbert L. Wheeler and Alderman James H. Mellen.

The stockholders of the Goshen, Ind., Telephone Company have elected the following directors: J. A. Arthur, Wilson Roose, George D. Lint, all of Goshen; A. L. Barber, Wauseon, Ohio, and James A. Bireley, of Toledo, Ohio. The capital stock of the company is $30,000, and of this amount $20,000 will be represented by the exchange property at Goshen, a 400-drop exchange board being put in. Toll lines will be constructed in Elkhart, Noble, Kosciusko and St. Joseph counties, and some of these lines are now under construction. Free service is to be given between Elkhart and Goshen, 10 miles, to subscribers of the home companies in the two cities.

The Alaska Telegraph and Telephone Company, composed of San Francisco men, has a franchise from the Canadian Government granting the right to construct, operate and maintain telegraph and telephone lines in Canadian territory over the Chilkoot Pass, running along the lakes and up the Lewis and Yukon rivers to Dawson City. The line will begin at Juneau, Alaska, thence in a northerly direction to Dyea, thence in a northeasterly direction over the Chilkoot Pass. It will follow the line of the Lewis and Yukon rivers to Dawson City and on to Circle City, the terminus. The estimated length of the line and its branches is said to be about 1,000 miles.

THE MUNICIPAL ELECTRICIANS.

ANNUAL MEETING OF THE POLICE AND FIRE-ALARM TELEGRAPH SUPERINTENDENTS AT ELMIRA, N. Y. —J. W. AYDON ELECTED PRESIDENT—WILMINGTON, DEL., NEXT MEETING PLACE.

The meeting of the National Association of Police and Fire-Alarm Superintendents was held at Elmira, N. Y., in the assembly chambers, August 9 and 10. President W. Y. Ellett presided, and very interesting sessions were held. The city of Elmira extended all possible hospitality to the visiting electricians.

A number of interesting papers were read and discussed.

The proceedings of the first day were opened by prayer by Rev. A. Cameron Mackenzie. Judge S. S. Taylor delivered the address of welcome and was responded to by Mr. C. E. Stump, of New York, of *City Government*.

President Ellett then delivered his annual address.

Addresses followed by Capt. Wm. Brophy, of Boston, on "Electrolysis;" Morris W. Mead, of Pittsburgh, on "Maintenance of Central Offices and Use of Storage Batteries;" W. H. Thompson, of Richmond, Va., on "Aerial Construction."

All these papers were discussed at length and will appear in full in the report of the association.

Sixteen new active members were elected and four associate members.

A letter, containing a paper entitled "The Father of the Automatic Telegraph System," was received from M. Channing, of California. It was read and received with applause.

A committee consisting of Frank C. Mason, of Brooklyn; M. W. Mead, of Pittsburgh; William Brophy, of Boston; Adam Bosch, of Newark; Clarence Stump, of New York, and Will Y. Ellett, of Elmira, was appointed to send a telegram of acknowledgement and the congratulations of the delegates.

A slight change in the constitution was voted upon, making the dues for membership $10 instead of $5, after which was the election of active and associate members.

The treasurer's report showed a balance on hand of $240.

A paper by Frank P. Foster, of Corning, "The Difficulties a Superintendent Has to Contend With and the Best Way to Avoid," was read according to programme, receiving hearty applause.

Jonathan W. Aydon, of Wilmington, Del., told "What the Association Has Accomplished Since Its Organization."

The election of officers resulted as follows: President, J. W. Aydon, Wilmington, Del.; vice-president, G. T. Macdonald, Ottawa, Can.; treasurer, Adam Bosch, Newark, N. J.; secretary, H. F. Blackwell, Jr., New York; financial secretary, Burt McAllister, Bradford, N. Y.

Executive committee—William Y. Ellett, Elmira; M. W. Mead, Pittsburgh; W. H. Thompson, Richmond, Va.; William Brophy, Boston; F. C. Mason, Brooklyn.

Four cities asked for next year's convention. They were Detroit, Mich.; Wilmington, Del.; Bridgeport, Ct., and Bradford, N. Y.

Newly elected President Aydon upheld the claims of Wilmington and that city was selected for the next convention. The first Tuesday in September, 1899, was decided upon as the date for the next convention. The convention adjourned noon Wednesday.

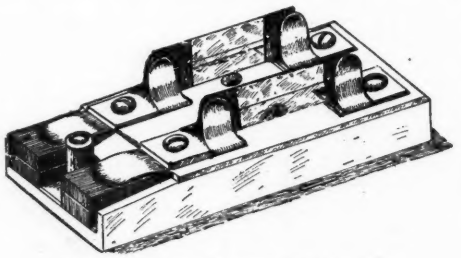
Chief Campbell gave an exhibition of the efficiency of the Elmira fire department for the entertainment of the guests by pulling box No. 413, calling out all four stations.

The delegates visited the reformatory Wednesday afternoon. In the evening the ladies visited the office of Dr. F. W. Ross and witnessed an X-ray exhibition.

The gentlemen were tendered a stag social in the lodge-room of the Elks at 9 o'clock in the evening. On Thursday the association took a trip to Watkins Glen and Seneca Lake via the Northern Central Railroad.

The delegates present at the convention were:

Frank C. Mason, Brooklyn, superintendent police telegraph; William B. Green, Brooklyn, Brooklyn *Daily Eagle*; A. P. Eckert, New York city, Safety Insulating Wire and Cable Company; Frank P. Foster, Corning, superintendent fire telegraph; Burt McAllister, Bradford, Pa., superintendent fire telegraph; H. H. Blackwell Jr., New York city, superintendent fire-alarm; Thomas J. Welsh, Buffalo, superintendent fire telegraph; George F. Porter, New York, Kerite wire and cables; W. S. Eckert, New York, John A. Roebling's Sons Company; Clarence E. Stump, Brooklyn, *City Government*, New York; William A. Baines, Bridgeport, Ct., superintendent fire telegraph; Louis W. Miller, Rochester, superintendent police and fire telegraph; Morris W. Mead, Pittsburgh, superintendent bureau of electricity; H. C. Bundy, Watertown, superintendent fire-alarm; William Brophy, Boston, Mass., inspector of wires; Frederick Pearce, New York; Lema Lemon, Baltimore, superintendent fire telegraph, and wife; Adam Bosch, Newark, N. J., superintendent fire-alarm system, wife and daughter; Frank M. Ferrin, Boston, Mass.; W. H. Thompson, Richmond, Va., superintendent fire telegraph company; George T. Manson, New York, Okonite company; J. W. Ogden, wife and daughter; T. J. Harper, Atlanta, Ga., city electrician; William Exall, Newark, N. J., captain hook and ladder company, Newark fire department; George F. Macdonald, Ottawa, superintendent fire-alarm; William Crane, Erie, Pa., city electrician; S. L. Wheeler, Springfield, Mass., city electrician; A. C. Mackenzie, Elmira College; E. J. Fenlon, National Conduit and Cable Company, New York; G. L. Wiley, New York, Standard Underground Cable Company; W. Y. Ellett, Elmira.



FUSE BLOCK AND LIGHTNING ARRESTER.

A New Combined Fuse Block and Lightning Arrester.

The telephone department of the Electric Appliance Company, Chicago, has just put upon the market a combined fuse block and lightning arrester. It is an article of merit and merits the attention of telephone exchange managers. It is four and one-fourth inches long by one and one-half inches wide. The illustration herewith gives a very fair idea of its appearance. Protection is secured from burn-outs from crosses caused by trolley and electric light lines breaking and falling across the telephone wires. It is a positive lightning arrester and is practically indestructible. It requires no attention.

The effect of a lightning discharge across the carbon blocks is that of producing a small amount of carbon dust; this can easily be removed by pulling out the carbon blocks and blowing out the dust, then replacing them, and the arrester is in working order again.

The fuse end of the arrester should always be connected to the wires running to the instrument to be protected, and the carbon arrester end directly to the line wires.

The lightning arrester, part of this block, is constructed with two carbon blocks with perforated mica separating them. One block rests on the ground plate and the other is connected directly on the line, the idea being to produce an arrester on the air-gap principle.

The perforations in the mica separator produce this result when the carbon blocks are placed in their proper position on the arrester.

The fuse portion of the arrester can be furnished with either the Postal or Western Union type terminals, an ordinary two-inch copper or foil terminal fuse being used. The base is made of porcelain.

INDUSTRIAL NOTES.

Stanley & Patterson, the electrical supply house, New York, are putting into their telephones a transmitter using the diamond-grain carbon, which is especially imported and prepared for the purpose. The process through which it is put is a secret one and has not been duplicated by other manufacturers. The result attained is in giving the carbon a very fine resistance, which is necessary for the best transmitter.

The Erickson Telephone Company, 20 Warren street, New York, have just issued a catalogue of the Swedish telephones, for which they are American agents. The Erickson telephones have been in use since 1873, but only within a few years have they been known in this country. Since their introduction, however, they have met with an excellent reception. In addition to the apparatus of the foreign make, the company produce a complete line of telephones and equipments for long and short-distance work and interior service.

The Central Electric Company, of Chicago, who are acting as western distributors for the various types of Samson batteries, report a large and continuously increasing use of this product. The Samson battery has attained an enviable reputation as a product for use under conditions requiring the most exacting service. There has been quite recently introduced the new Samson semi-dry battery, which has become very popular by reason of its desirable features. This battery has extra heavy zincs and large carbons contained in a porcelain jar and sealed. Its ampere output is very large, and as it is portable, it is adapted for use under conditions where the former type of open batteries could not be used. The Central Electric Company are carrying large stocks of all Samson types and are prepared to make immediate shipment on all orders.

ROENTGEN-LIGHT NOTES.

BY WILLIAM ROLLINS.

NO. XXXIV—ON THE FALLACY OF USING THE EQUIVALENT AIR SPARK AS A MEASURE OF THE DEGREE OF VACUUM IN A ROENTGEN-LIGHT TUBE.

In the writings of men interested in vacuum tubes it is not unusual to find the degree of vacuum in a Roentgen-light tube measured by the

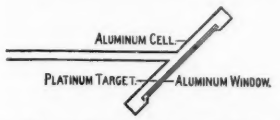


FIG. 32.—"ROENTGEN-LIGHT NOTES."

equivalent spark in air. That other data should accompany this statement is shown by the following experiments. If we keep the temperature of the water at 30 degrees centigrade, in a tube like that shown in Figure 30, Note XXX, and pump the vacuum until the resistance is equal to nine inches of air, when the tube is excited on a large static machine, we shall find, on exciting it with a Lawrence and Norton coil and a 20-microfarad condenser, that the equivalent spark in air is much less, usually about three inches. If we now excite the tube on an alternating-current dynamo, the length of the equivalent spark in air will be still less. Even with different types of induction coils, the equivalent air spark varies, depending on the mode of winding. As extended description of experiments is out of place in these short notes, I say briefly that at the degree of exhaustion required to produce Roentgen light, the resistance of the tube, as measured by the equivalent spark in air, is inversely as the voltage; that the lower the voltage, the higher the vacuum must be to produce an equal amount of Roentgen light.

NOTE XXXV—COVERING THE TARGET WITH ALUMINUM.

If we examine a Roentgen-light tube having an aluminum cathode and a platinum anode we shall find, after it has been used a considerable time, that the deposit on the walls is of two colors. There is a more generally diffused purple deposit from the cathode and a less generally diffused brown deposit from the platinum. Fortunately, the latter deposit is less in front of the target, otherwise the amount of Roentgen light yielded by the tube would be more rapidly reduced than it is by use. As the deposit does somewhat diminish the efficiency of the tube I tried covering the target with a thin layer of aluminum. Such a target is shown in Fig. 32. Fig. 33 shows the same idea applied to a cooled target. I hoped that the platinum would act like the silver coating at the back of a glass mirror and prevent the loss by transmission which was supposed to take place when aluminum was used as a target. I first tried this experiment two years ago and do not now attribute much practical importance to this form of target, believing that the inefficiency of aluminum is not so much due to its transparency to Roentgen light as to the fact which this experiment pointed out—that the individual particles of the cathode discharge are not raised to so high a temperature by the same voltage when they strike an aluminum target as when they strike one of platinum or some allied metal, because the shock of impact being less sudden, heat is developed during a longer time and therefore never attains the maximum.

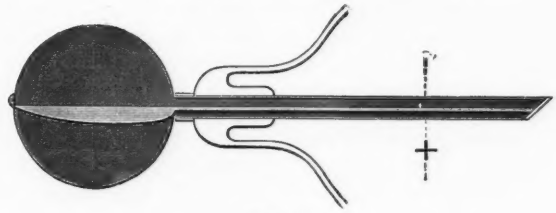
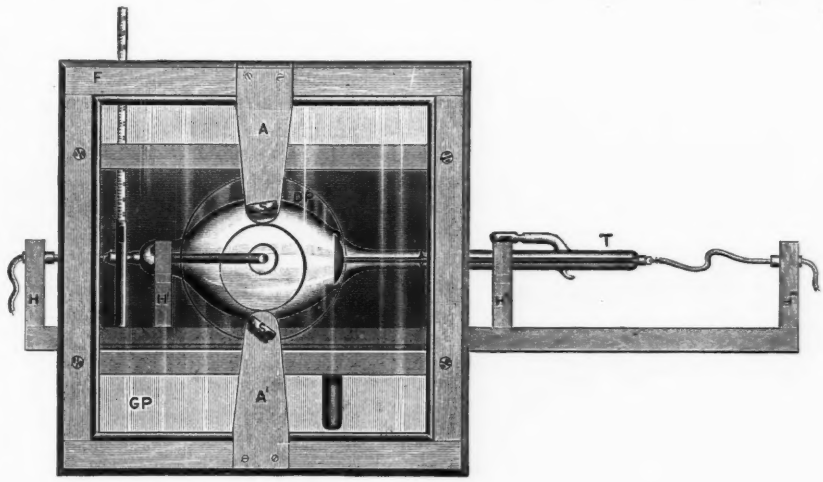


FIG. 33.

NOTE XXXVI—DIAPHRAGMS FOR ROENTGEN-LIGHT TUBES.

So many experimenters, the writer among the number,* have invented the diaphragm for sharpening the shadows cast by objects in the path of Roentgen light that it is a matter of some difficulty to determine to whom the credit belongs. Very probably it belongs to Roentgen, as almost everything appears to do except Trowbridge's discovery that under a sufficiently high voltage every part of a continuous metallic conductor gives off Roentgen light. However, the first mention I have found is an article by Leeds and Stokes in the *Western Electrician* for March 14, 1896. Considering the value of diaphragms it is remarkable that within a little over two years of their discovery they should have practically gone out of use. As we increase the power of our generators it becomes more important to employ them because, as stated in Note XVII, a powerfully excited tube gives Roentgen light over a large surface beside the radiant area on the target.

Diaphragms have always been made of metal, but this is objectionable, because a conductor placed between the terminals of a tube reduces the length of the air-column and consequently the available spark length, besides increasing the danger of puncturing the tube. To overcome these difficulties I use glass half an inch thick. The arrangement is shown in Fig. 34. It is a wood box to hold the tube, and a frame for the glass plate G P, which is one foot square with a three-inch hole in the center. Covering the hole is another circular glass plate D P, with a smaller hole in the center. The latter plate can be removed and one with a different size hole substituted. The plates are held in contact by the screws S S on the ends of the two arms A A. As stated in my first article on this subject, this is simply the principle of Zentmayer's microscope stage applied to another purpose. It enables the experimenter to easily bring the opening in the diaphragm in proper relation to the radiant area on the target. The use of glass instead of metal occurred to me from seeing Dr. Williams's glass screen, which he keeps between the tube and his legs when examining patients. Figs. 34 and 35 show the tube-holder in position for examining a patient in a vertical position, Figs. 36 and 37 its positions above or below the patient when he is lying down. The whole holder has a vertical range of six feet by means of the arm H A partly shown.



SCALE, ONE SIXTH.

FIG. 34.

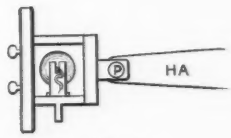


FIG. 35.

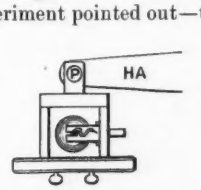


FIG. 36.

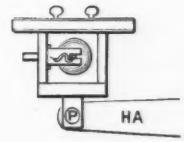


FIG. 37.

NOTE XXXVII—COOLING THE TARGET WITH METAL VANES.

Instead of using water to cool the target when we use moderate amperage, it is sufficient to put a copper stem into the hollow platinum target and expand the end into four vanes, as shown in perspective and section in Fig. 37.

* *International Dental Journal*, August, 1896.

Honors for Mr. Thomas B. Doolittle.

The Committee on Science and the Arts, of the Franklin Institute of Philadelphia, have awarded to Mr. Thomas B. Doolittle, the well known telephone pioneer, the Edward Longstreth medal of merit for his work in the introduction of hard-drawn copper wire. The following is the report of the committee adopted June 1, 1898, and is an honor that we think is well deserved and appropriately bestowed, although coming to him more than 20 years after his ideas had been put into practical use:

Hard-drawn copper wire—Thomas B. Doolittle, Branford, Ct.

Abstract—The report refers to the fact that Mr. Doolittle, in the year 1877, suggested the use of hard-drawn copper wire for telephone and telegraph uses, and in the same year, at the works of the Ansonia Brass and Copper Company, Ansonia, Ct., succeeded, after many experiments, in producing about 500 pounds of this material, which was employed on a telephone line connecting these works.

This method consists in using drawing-plates containing a larger number of holes than the ordinary plates used in copper wire drawing, and increasing the number of passes for a given reduction of area. By this means it is possible to draw copper wire from the beginning to the end of the operation without any annealing, and at the same time to avoid the crystallizing of the metal. The wire thus produced is sufficiently flexible to permit of the formation of standard telegraph wire joints without breaking or cracking.

The hard-drawn copper wire made by the Doolittle method has its tensile strength doubled and its elongation reduced to about one per cent, while its electrical conductivity is not materially impaired.

The report dwells upon the great utility of such hard-drawn copper wire for aerial conductors on account of its high conductivity and great tensile strength and reliability in prolonged service, which were amply demonstrated by Mr. Doolittle in his efforts to secure its adoption by the electric line builders, and it was due entirely to his persistent endeavors that hard-drawn copper wire was at length adopted for telegraph and long-distance telephone purposes.

Hard-drawn copper wire has now become a staple article of manufacture, not less than 80,000,000 pounds having been produced in the United States alone, in 1896. It is now frequently employed for all kinds of electric conductors, and especially for long-distance telephone lines, the successful operation of which, the committee of investigation admits, is in large measure due to its introduction.

The report concludes that Mr. Doolittle is entitled to recognition:

1. For having been the first to recognize the value of hard-drawn copper wire, and for having, by his persistent endeavors, in the face of adverse conditions, succeeded in establishing its use for electric conducting wires, and

2. For his long continued experiments and labor in overcoming the many difficulties encountered in producing, on the commercial scale, a hard-drawn copper wire suitable for electric conducting wires.

The Reason for the Cost of Long-Distance Telephoning.

[*From the Boston Herald.*]

An authority on such matters, presumably, tells us that some impatient criticism of long-distance telephone rates might be saved if the public understood better the basis on which such charges are made. The correspondent by telephone must have all the line when he requires it, and practically the entire earnings of the long-distance line must be within the hours when business men are at their offices. The capacity of a long-distance line is confined to an average of six conversations an hour, so that the rate must be sufficient to yield during a limited time an adequate return upon the investment and expense. Telephone rates, therefore, are based on mileage, and the time the line is occupied in arranging the connection, in conversation, and in disconnecting. Many people are unable to understand the cause of the difference of the rates for telegraph and telephone service. This difference is easily explained. The telegraph employs a single wire conductor, and by the quadruplex system this wire is made to serve the purpose of four wires. The long-distance telephone service requires two copper wires for each circuit, which, together, weigh nearly double what the single iron wire does, and costs over five times as much per pound. The general construction and equipment of the long-distance telephone service is also far more expensive than that of the telegraph. Furthermore, an ordinary 10-word telegram may be transmitted in a minute, and four messages can be going over the same wire at the same time. Each completed conversation over the long-distance telephone occupies two wires for 10 minutes, which brings the comparison to two wires for 10 minutes, as against one-fourth of one wire for one minute. Another essential difference in the two systems is that the sender of a telegram writes out his message, and goes about his business, and the operator forwards it when convenient, thus keeping the telegraph lines fully employed at all hours, whereas the telephone must necessarily be inactive for the greater part of the 24 hours.

The New England Telephone Company have been changing their "trunk lines" running out of Burlington, Vt., and have run a new line out of the city from the eastern side, thus avoiding all other lines, striking the main line near Essex Junction. There will be room for 30 wires on the poles, 12 of which are to be strung now.

Electric Power in London.

We are informed by the City of London Electric Lighting Company that they are about to introduce a continuous-current system of supply for motive power in the city. This entails new mains, but we understand that these will be ready in about three months. The maximum rate of charge will be 3d. per Board of Trade unit, which is equivalent to 2¼d. per electrical horse-power per hour, but by the word maximum we hope a reduction for quantities is to be inferred. Such a reduction will, we think, offer an inducement for the adoption of such means of driving machinery in place of other mechanical power, such as steam and gas, as are objectionable in the heart of a city.

The company is asking for promises to take power in order that the demand may be gauged, and the details of probable demand in brake horse-power and lengths of running will not be held to commit the consumer to take the power eventually. Motors may be hired from the company if desired.

It seems wonderful that the company should have passed over the multiphase system in favor of continuous currents when putting down new mains for power purposes. The difficulties of supply are less and the speed regulation obtained much less dependent on the voltage of supply when the three-phase currents are used. We do not doubt but that the engineers of the company have considered the point, but wonder what finally induced them to put down a direct-current plant. That in some areas the lights may also be supplied at times from the plant is the only suggestion we can make, but surely the pressure of the power mains will be too high to allow of this being done.—*London Electrical Engineer.*

Telephones in Cape Colony.

Consul General Stowe writes from Cape Town, April 25, 1898:

The telephone service of Cape Colony is under the control of the Colonial Government. On April 9, 1898, there were 1,535 instruments in use, and the revenue for 1897 amounted to $66,137.22. There are 869 miles of wire and 780 subscribers. Seven exchanges in the colony work on the single-wire system, but arrangements are now being made to have all lines duplicated, and in future no exchange will be established except on the metallic-circuit system.

In the course of the next few months the underground cable system in Cape Town will be completed and exchanges established in the suburbs.

ELECTRIC RAILWAY NOTES.

The Knoxville, Tenn., Belt Line Railroad, encircling that city, has been sold to the Southern Railway for $9,000.

The Delaware, Ohio, Electric Street Railway has been sold to B. W. Brown and others, of that city, for $13,525. The road cost originally $80,000.

The Ottawa, Canada, Street Railway Company is reported to have purchased the Ottawa & Gatineau Valley Railway, which is to be converted into an electric road.

A Maine syndicate, represented by W. B. McKinley, of Chicago, has bought the electric street railway system, of Quincy, Ill., for $220,000. The same syndicate controls street car systems and light plants in Joliet, Bay City, Champagne, Springfield, Ohio; Trenton, Mo., and other cities. The syndicate will spend $100,000 for extensions and rolling stock.

The quarterly report of the Herkimer, Ilion & Frankfort, N.Y., Electric Railway Company for the quarter ended July 30 shows:

	1898.	1897.
Gross earnings	$9,816	$9,753
Operating expenses	4,627	5,019
Net earnings	5,189	4,734
Fixed charges	2,052	2,542
Net income	3,157	2,282

The general balance sheet shows assets of $345,958, including $343,917 for cost of road and equipment, and $1,392 cash on hand. The liabilities include $150,000 capital stock, $150,000 funded debt and $15,222 profit and loss (surplus).

At a special meeting of the board of directors of the Laconia & Lakeport, N.Y., Street Railway Company, the following new board of directors was elected: Harry L. Pierce, Chas. T. Foster, of Leominster, Mass.; Geo. H. Cooke, of Athol, Mass.; Samuel B. Smith, Albert G. Folsom, Edmund Little, of Laconia, and Alpha J. Pillsbury, of Tilton. Messrs. Pierce, Foster and Cooke were elected to fill vacancies created by the resignation of Charles F. Stone, Samuel C. Clarke and Edwin C. Lewis. The board subsequently organized by the election of Harry L. Pierce, president; Charles T. Foster, treasurer, and Edmund Little, clerk, Mr. Little having tendered his resignation as treasurer of the old corporation. Lewis S. Pierce, of Leominster, Mass., was elected superintendent, to succeed Nathan H. Dunbar, the present incumbent, and will assume the duties of superintendent September 1.

Concentration of Power by Electric Transmission.

One of the most forcible of the advantages of electrical transmission of power is that this method often makes it possible to combine two or more steam plants into one, greatly diminishing the cost of labor and supplies. Such an advantage appeals especially to the mill owner, who may operate shafting in several buildings and departments by separate sources of power. A conspicuous example of this wasteful arrangement is in the works of one of the largest locomotive shops of the country, where part of the plant is operated by water-power, part by steam-power and part by compressed air, the latter necessitating an extra engine and compressor.

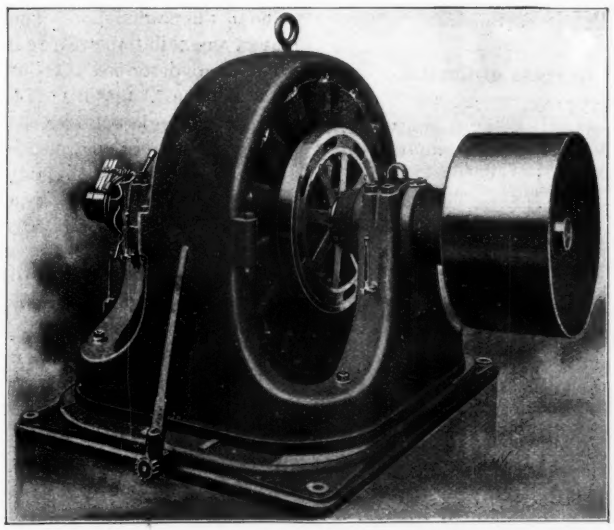


Fig. 1.—"Concentration of Power by Electric Transmission"—Westinghouse Generator, 150 K.-W.

Electric transmission, and notably the polyphase system, as developed by the Westinghouse company, has made it possible to centralize the power in such shops. When Lieut. I. G. Garrett took charge of the affairs of the Atlas Tack Company, of Taunton, Mass., as manager, he instituted a thorough investigation as to the power required for the various classes of tack-making machinery under normal conditions. The mills of this company at Taunton are three in number, located from 800 to 1,200 feet apart, and were, until recently, operated by three separate steam plants, with the accompanying wastefulness incident to small units. It was found that owing to variations in the amount of power required from day to day for the different classes of work the duty of the three steam plants could be easily performed by a single steam plant of two-thirds their united capacity.

So large a saving in coal and labor as was expected from this arrangement induced Lieutenant Garrett to engage the services of Mr. T. W. Sprague, of Boston, Mass., to investigate jointly with him the various systems of transmission. The parties interested inspected personally a number of the principal polyphase plants among the New England mills, and finally selected the Westinghouse three-phase system, 3,600 alternations, as best adapted to the work of the Atlas Tack Company. This system, in connection with the Tesla "type G" motors, made by the Westinghouse Electric and Manufacturing Company, has attained marked success in every instance in which a plant has adopted it, and the alternate-current motor, though developed later than the direct-current motor, has been favorably received in all such installations.

The Atlas Tack Company are to use a 150-kilowatt Westinghouse generator, shown in Fig. 1, which will operate nine Tesla induction motors of the above type, shown in Fig. 2, ranging from three to 50 horse-power in the various mills. The gas lighting system of the mills will be replaced by about 1,000 incandescent lights.

The company instituting these changes is one of the most progressive of manufacturing concerns, employing over 500 men, and making some 10,000 brands of tacks, rivets, etc. Considerably over 50 per cent of all the tacks and rivets made in the United States are produced at their shops, and their electrical equipment will be watched with interest, and, no doubt, imitated by many other concerns of the kind.

The adaptability of the "type C" motor, as made by the Westinghouse company, to so many varied fields of usefulness has surprised many who have possibly been prejudiced against the alternating-current motor, by its late appearance on the market, as contrasted with the direct-current motor; but the cause of their surprise constitutes one of the strongest proofs of the reliability of this product.

It is reported that the Hudson County Electric Light Company, which has been operated for several years by the General Electric Company, had passed into the hands of a local syndicate represented by Edward F. C. Young, Bernard M. Shanley and Miles Tierney, who are connected with the North Jersey and Consolidated Traction companies and the North Hudson County Railway Company. Mr. A. M. Young, of Waterbury, Ct., negotiated the purchase.

ELECTRIC LIGHT FLASHES.

The Portchester, N. Y., Electric Light Company, recently organized, has elected the following officers: William E. Ward, president; Addison Johnston, vice-president; William L. Ward, treasurer, and Walter Comly, secretary. The capital stock of the company is $50,000, and plans are being prepared to erect a plant as soon as possible.

At the annual meeting of the Amesbury, Mass., Electric Light, Heat and Power Company the following directors were elected: Dr. B. H. Young, Dr. J. A. Douglass, Jas. Bakie, Ezra C. Morrill, Chas. Goss, Amesbury; Dr. J. F. Spaulding, Salisbury, and Harrison Rowe, Kensington. Dr. B. H. Young was re-elected treasurer.

At a meeting of the stockholders of the Quincy, Mass., Electric Light and Power Company the following officers were elected: Secretary, Walter M. Packard; treasurer, Henry M. Faxon; directors, Walter M. Packard, Henry M. Faxon, John R. Graham, Henry Hardwick, John Cashman, Thomas Feno. William G. A. Pattee was elected president.

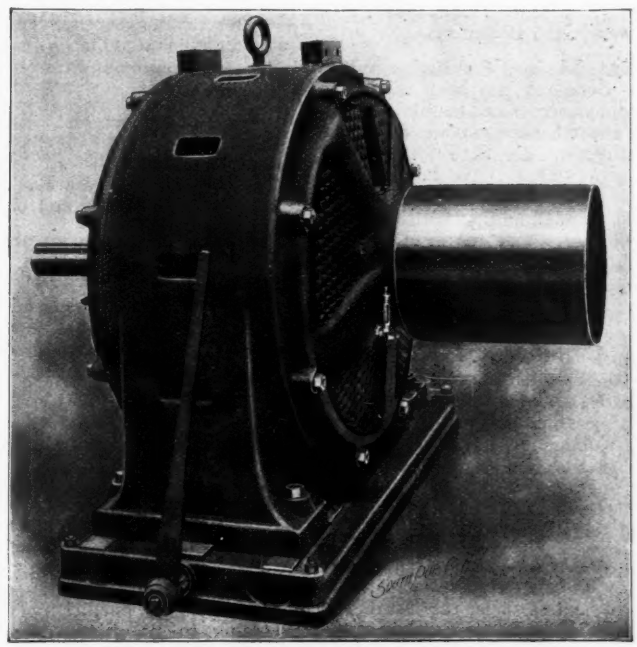


Fig. 2.—The Tesla Induction Motor.

The Geddes & Seerie Stone Company, of Colorado, has filed a $12,000 damage suit against the Pioneer Electric Power Company and the Union Light and Power Company in the United States Circuit Court. The damages are alleged to have been sustained through the failure of the Pioneer company to perform its part of a contract entered into between the parties for the construction of a wall across Odgen canyon.

At the annual meeting of the New Bedford, Mass., Gas and Edison Light Company the following officers were elected for the ensuing year: Directors, Gilbert Allen, Horace G. Howland, David B. Kempton, Thomas H. Knowles, John P. Knowles, Jr., Charles H. Lawton, John W. Macomber, Charles R. Price, George R. Stetson, Frederic Taber, Andrew G. Pierce, Oliver Prescott, Jr., John S. Perry; treasurer and clerk, Charles R. Price.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

DENVER, COLO. — The Albuquerque-Bland Telegraph and Telephone Company has been incorporated. The incorporators are William F. Powers, of Albuquerque, N. M.; Belvidere Brooks, of Denver; John J. Dickey, of Omaha, and Anthony L. Conrad, of Trinidad, Colo.

KANKAKEE, ILL. — Colonel Snow and Dr. Patrick, of Chicago, have purchased the controlling stock of the Livingstone County Telephone Company, and will consolidate it with the Eastern Illinois.

TORONTO, ONT. — The Canadian Pacific Telegraph Company, having completed their new copper wire between Ontario and the Pacific coast, are now able to give better facilities, and consequently have reduced their rates 20 per cent from Ontario points to a number of offices in British Columbia.

PENN YAN, PA.—The New York & Pennsylvania Telephone Company is rebuilding its line from Hammondsport to Gibson. The metallic circuit will be used and the line built straight along Lake Keuka through to Gibson with branches running to Pulteney and South Pulteney.

RIPLEY, N. Y.—The Ripley Telephone Company has been incorporated, to construct and maintain lines in and about Ripley; capital, $12,000. The directors are S. Fred Nixon, Vernon A. Kent, Otis L. Ingalls, Clayton J. Bannister, of Westfield; Fred N. Randall and J. Watson Burrows, of Ripley, and George H. Frost, of Buffalo.

SHIPPENBURG, PA.—An effort is being made to organize a telephone company in this county. Among the interested parties are M. F. Thompson and Walter Stuart, Carlisle; J. L. Shelly, Mechanicsburg; W. B. Oyler, Newville, and R. W. Hockersmith, Shippenburg. It will be called the Southern Pennsylvania Telephone Company, and will operate lines of telephone and telegraph in Cumberland and adjoining counties.

CARLISLE, PA.—A new telephone company is being organized at this place, to be known as the Southern Telephone Company. The incorporators have made application for a charter and will operate lines of telephone and telegraph in Cumberland, Adams and Dauphin counties.

QUAKER CITY, OHIO—Quaker City Telephone Company has been incorporated, to build and operate a telephone line in the city and between neighboring towns.

COLUMBIA, S. C.—I. L. Withers, W. D. Melton and others are endeavoring to form a company to establish and operate a telephone system.

SPARTANSBURG, S. C.—The Citizens' Telephone Company has been incorporated, with a capital stock of $8,000, for the purpose of building and equipping a telephone exchange.

Electric Light and Power.

MORRISTOWN, N.J.—Daniel Burns, of this place, has been awarded the contract for erecting the large addition to the electric light station, to cost $4,500. The Council will also purchase a new dynamo and switchboard. The improvements in the station and the new engines, wells, dynamo and switchboard will cost over $30,000.

WASHINGTON, D. C.—The contract for furnishing electric lights in Lafayette, Franklin, Judiciary and Lincoln parks has been awarded to the Potomac Electric Power Company.

FORT WAYNE, IND.—The Fort Wayne Electric Corporation has secured the contract for replacing the plant of the Port'and, Ind., lighting company.

LIVE OAK, FLA.—The Mayor may be addressed concerning contemplated erection of electric light plant.

MASON, TEX.—The Mason Electric Light Company has been incorporated, to furnish electric lights for private and public purposes in the town of Mason; capital stock, $5,500.

SEATTLE, WASH.—The Snoqualamie Falls Power Company will erect an electric light plant, which will supply Seattle and Tacoma with electric lights and power.

MATTOON, ILL. — The Mattoon Heat, Light and Power Company has been incorporated by C E. Wilson, Louis Katz, J. F. Marks, Allan McFall, J. A. Montague and others; capital stock, $52,000.

New Electric Railways.

LACONIA, N. H.—The electric line from this place to The Wiers is contracted for and is to be completed by November 1.

ELYRIA, OHIO — The Toledo & Cleveland Electric Railway Company has been incorporated, with a capital stock of $500,000. This means that the projected Sandusky-Lorain electric line will be built this year.

CHATTANOOGA, TENN.—The Chattanooga Rapid Transit Company is rebuilding the old Belt railway tracks, preparatory to the operation of regular trains to St. Elmo, Mountain Junction and Bowling Springs. The company, besides operating the Chickamauga Park trains, is now running regular cars to all suburbs touched by the cars of the Chattanooga Electric Railway.

ALBANY, N. Y.—A certificate has been filed by the Westchester Electric Railroad Company with the Secretary of State certifying its intention to extend its road in the city of Mount Vernon. Former Mayor Edward A. Maher, of this city, is now the president of the Westchester Electric Railroad.

HOLLY, MICH.—The Flint & Lansing Electric Road Company have asked franchises through several townships in Oakland County.

STEUBENVILLE, OHIO—An electric railway route is being surveyed between Steubenville and Mingo Junction. It is expected if the line is built to extend it to Toronto, Ohio, and then to connect it with the Wellsville & East Liverpool Street Railway.

BELLEVILLE, ILL.—The Suburban Electric Railway have been granted permission for right of way by the Board of Trustees of the village of Winstanley Park.

HOUSTON, TEX.—Ex-Mayor Frank P. Holland and William H. McGrath, of the Dallas Electric Company, are organizing a company to build a suburban electric railroad.

Increase of Capital.

TORRINGTON, CT.—The Torrington Electric Light Company has voted to increase its capital stock from $24,000 to $50,000.

CHICAGO, ILL. — The Commonwealth Electric Company has certified to an increase in capital stock from $500,000 to $5,000,000.

New Incorporations.

NEW YORK, N. Y.—The National Light and Power Company has been incorporated for the purpose of manufacturing necessary apparatus and solution for producing electric currents; capital stock, $10,000, with the privilege of increasing the same to $5,000,000. Incorporators, Edward S Savage, Rahway, N. J.; M. D. Valentine, Woodbridge, N. J.; A. W. Sherman, of Brooklyn; Albert Burns, of The Bronx, N. Y., and A. L. Sherer, of Manhattan, N. Y.

PHOENIX, ARIZ.—The Black Canyon Hydraulic and Electric Company has been incorporated; the incorporators are all residents of New York; the incorporation is for $5,000,000.

TORONTO, ONT.—The Ontario Telephone and Switchboard Construction Company, Limited, has been incorporated, with a capital of $75,000. Incorporators, Messrs. Robert Fox, T. H. Smallman, F. B. Leys, T. H. Purden, R. A. Bayly, John Labatt, Moses Masuret, John Milne, Dr. J. D. Wilson and J. R. Minhinnick, of London, and R. H. Evans and H. C. Walters, of Detroit.

NEW YORK, N. Y.—The Edmond Electric Traction and Signal Company has been incorporated, for the purpose of building, equipping and maintaining railways and signals and signal stations and furnishing electric heat, light and power; capital, $5,000,000. Incorporators, D. N. Maxon, G. E. Cruse, C. S. Jones, D. A. Davies and R. H. E. Starr, all of this place.

CLEVELAND, OHIO—Electric Terminal Company has been incorporated by H. A. Everett, C. W. Wason, E. W. Moore, B. Mahler and W. F. Carr, to erect buildings for the use of telephone and electric street railway companies; capital stock, $300,000.

Interest in the Diesel Motor at the Munich Exposition.

A collective exhibition has been made at the Munich Exposition of the Diesel caloric motor by the Augsburg Machine Company, where the invention of Mr. Diesel was first built and tested in practical form; Messrs. Fred Krupp, in Essen; the Machinery Construction Company, of Nuremberg, and the well known Otto Gas Motor Manufacturing Company, of Deutz-Cologne—four of the most important and powerful manufacturing firms in Germany, whose names form a sufficient guarantee of the industrial value of the new engine. The Diesel motors on exhibition are five in number, and are described as follows:

1. By the Augsburg Machinery Company: Single cylinder, 30-horse-power motor, for petroleum fuel; drives a rotary pump that lifts 1,600 liters (398 gallons) of water per minute to a height of 60 meters (196.7 feet).

2. By Fred Krupp, of Essen: Single-cylinder, 33-horse-power engine, which drives a high-pressure centrifugal pump that draws up from the river Iser a stream of water that is projected through a two-inch nozzle at 45 degrees elevation to a distance of 230 feet into the river.

3. By the Machinery Construction Company, of Nuremberg: A single-cylinder, 20 horse-power motor, which, at a speed of 180 revolutions per minute, is used for purposes of test and demonstration.

4. By the same company as above: One double-cylindered, 40-horse-power motor coupled directly to a Schückert dynamo, and at 180 revolutions per minute generates current for lighting the pavilion and driving a fast rotary printing press and several machine tools which are installed in the same building.

5. By the Otto Gas Motor Manufacturing Company, of Deutz-Cologne: One single-cylinder motor of 20-horse power, which propels a Linde condensing machine for the production of liquefied air.

Besides the four firms above named and represented at the Munich Exposition, three others—viz., the H. Paucksch Company, at Landsberg-on-the-Warthe; L. A. Rudinger, of Augsburg, and the Diesel Motor Fabrik, a special establishment organized at Augsburg for the purpose—are all now interested and engaged in the manufacture of Diesel motors for practical use. The invention, which was first publicly described at the meeting of the German Engineers' Association hardly a year ago, has thus already entered upon its career of economic usefulness.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 2, 1898.

(Concluded.)

608,246 Electrical signaling apparatus for transmitting commands; Conrad Arldt, Berlin, Germany.

608,249 Alternating current induction motor; C. S. Bradley, Avon, N. Y.—An alternating-current motor provided with two independent field magnets wound to develop rotary magnetic fields and two armatures of relatively high and low resistance co-operating with said fields.

608,258 Electric bond for railways; S. H. Harrington, New York, N. Y.

608,269 Electric arc lamp; C. A. Pfluger, Chicago, Ill.

608,277 Armature for dynamo-electric machines; E. H. Anderson, Schenectady, N. Y.—An armature for dynamo-electric machine, provided with two main paths for the field flux, as distinguished from the several paths through the armature teeth, which have practically the same magnetic reluctance, but which with a given field excitation work at different densities.

608,281 Trolley; F. E. Case, Schenectady, N. Y.

608,299 Commutator; W. B. Potter, Schenectady, N. Y.

608,301 System of train control; E. W. Rice, Jr., Schenectady, N. Y.—The combination with motor cars at different positions of a train, a single conductor connecting said cars, and a switch on one of the motor cars for coupling the motor equipments of the different cars in series or parallel.

608,302 System of train control; E. W. Rice, Jr., Schenectady, N. Y.

608,307 Electrical distribution; C. P. Steinmetz, Schenectady, N. Y.—The method of obtaining three-phase currents, which consists in connecting in series three single-phase alternating generators, and deriving three-phase currents from mains taken from points between said generators.

608,308 System of electrical distribution; C. P. Steinmetz, Schenectady, N. Y.—The method of producing polyphase currents, which consists in generating single-phase current, driving by said single-phase current a plurality of alternating motors in series, and maintaining by the mutual reactions of the machines a polyphase relation between the electro-motive forces of the system.

608,309 Regulating dynamo-electric machines; C. P. Steinmetz, Schenectady, N. Y.—The method of adjusting the stable working range of dynamo-electric machines, which consists in varying the reluctance of the magnetic circuit by a definite amount and at a predetermined flux.

608,319 Electro-mechanical lock; H. G. Carleton, New York, N. Y.

608,320 Electric combination lock; H. G. Carleton, New York, N. Y.

608,321 Electric lock; H. G. Carleton, New York, N. Y.

608,322 Combination mechanism for electric locks; H. G. Carleton, New York, N. Y.

608,333 Telegraphic transmitting and receiving apparatus; B. Hoffmann, Paris, France.

SITUATION WANTED—

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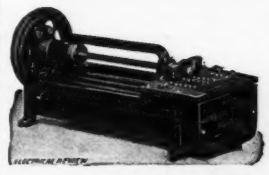

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A. C. Schoonmaker, 158 William street, New York, importer of mica for electrical uses, makes the following statement in a circular announcement: "To have the best and most satisfactory results you must use mica in its native condition, that is, in the solid sheet as it is mined, and it is only in this form I sell it to the trade. The mica I sell comes direct from the original sources in India. It is selected stock of guaranteed purity, and no region in the world furnishes a better article for insulating purposes."

The New England Sanitary Product Company are erecting at Old Harbor Point, Mass., near Boston, an absolutely fireproof building, 120 feet wide and about 130 feet long. The building is two stories high, and is of skeleton steel framework style, consisting of steel columns built in the walls, carrying heavy steel floor beams and girders, and clear span roof trusses which support the roof. The structural steel work in this plant was designed and is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Ct.

The Consolidated Safety Valve Company, 111 Liberty street, New York, have just gotten from the press an illustrated catalogue of the well known "Pop" safety valves. In addition to the descriptions and illustrations, which will be of general interest to all steam users, several testimonial letters are reproduced from such prominent makers of water-tube boilers as the Babcock & Wilcox company, the Stirling company, the Abendroth & Root Manufacturing Company, the Heine Safety Boiler Company. An interesting item mentioned is that, out of 3,737 "Pop" safety valves put out by the Babcock & Wilcox company, not a single valve proved faulty, and that during the career of the company over 200,000 valves of this type have been sold. The catalogue will be sent free on application.

The Busy Factory of the Warren-Medbery Company.

The new works of the Warren-Medbery Company, manufacturers of inductor alternators, Sandy Hill, N. Y., are now running to their utmost capacity, day and night, in order to fill the orders for their apparatus. Their business has increased over 100 per cent within the last 60 days, the demand for inductor machines reaching far beyond their utmost expectations.

They have recently made a large addition to their works, and the new machinery is now being installed, when they hope soon to be able to meet all demands upon them for alternators.

They are also manufacturing a full line of standard white marble switchboards, and a full line of the "Medbery" and "Standard" switches, so well and favorably known.

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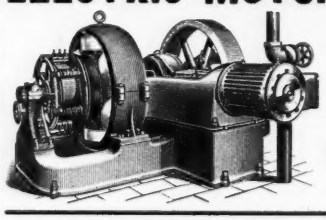
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